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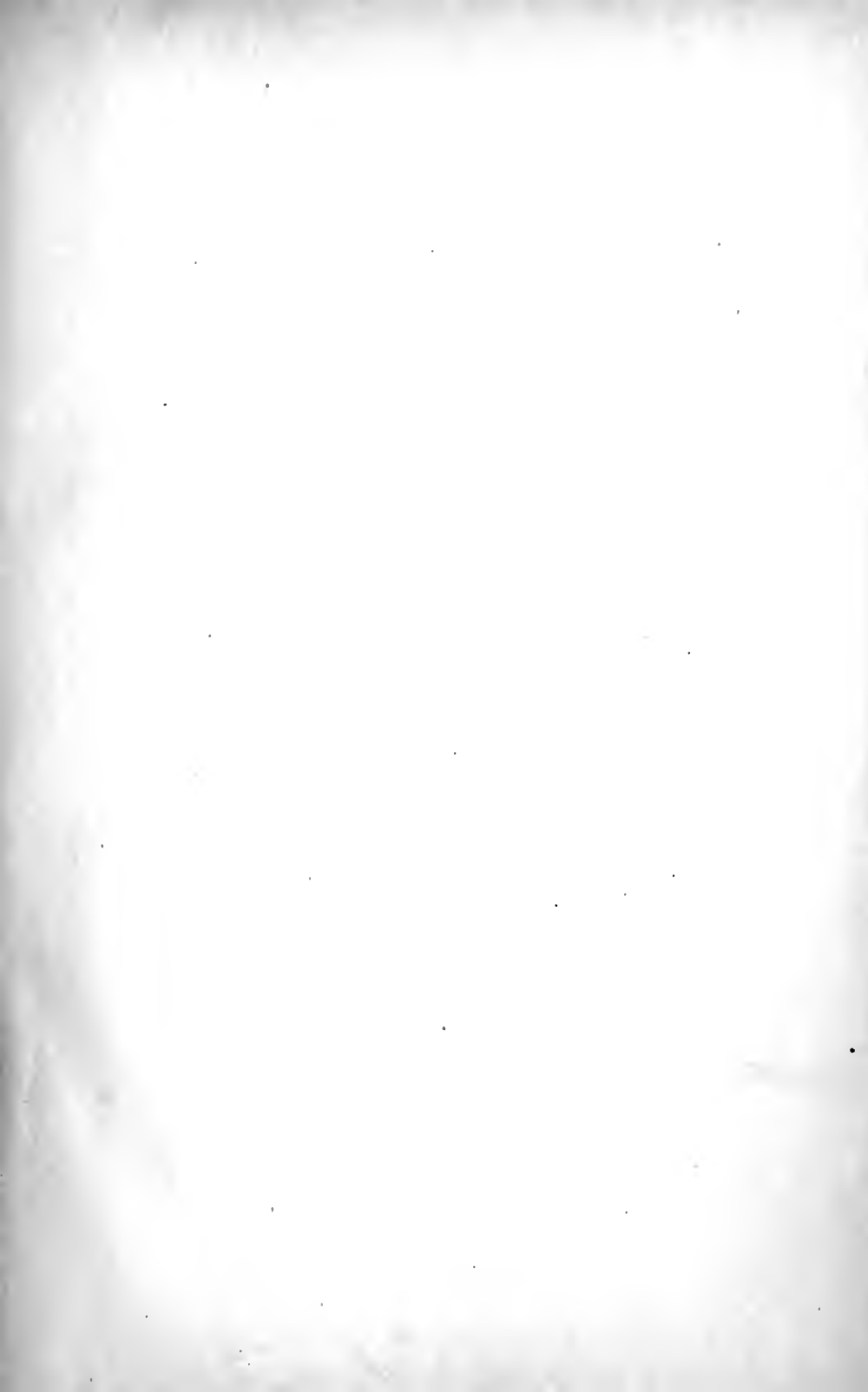
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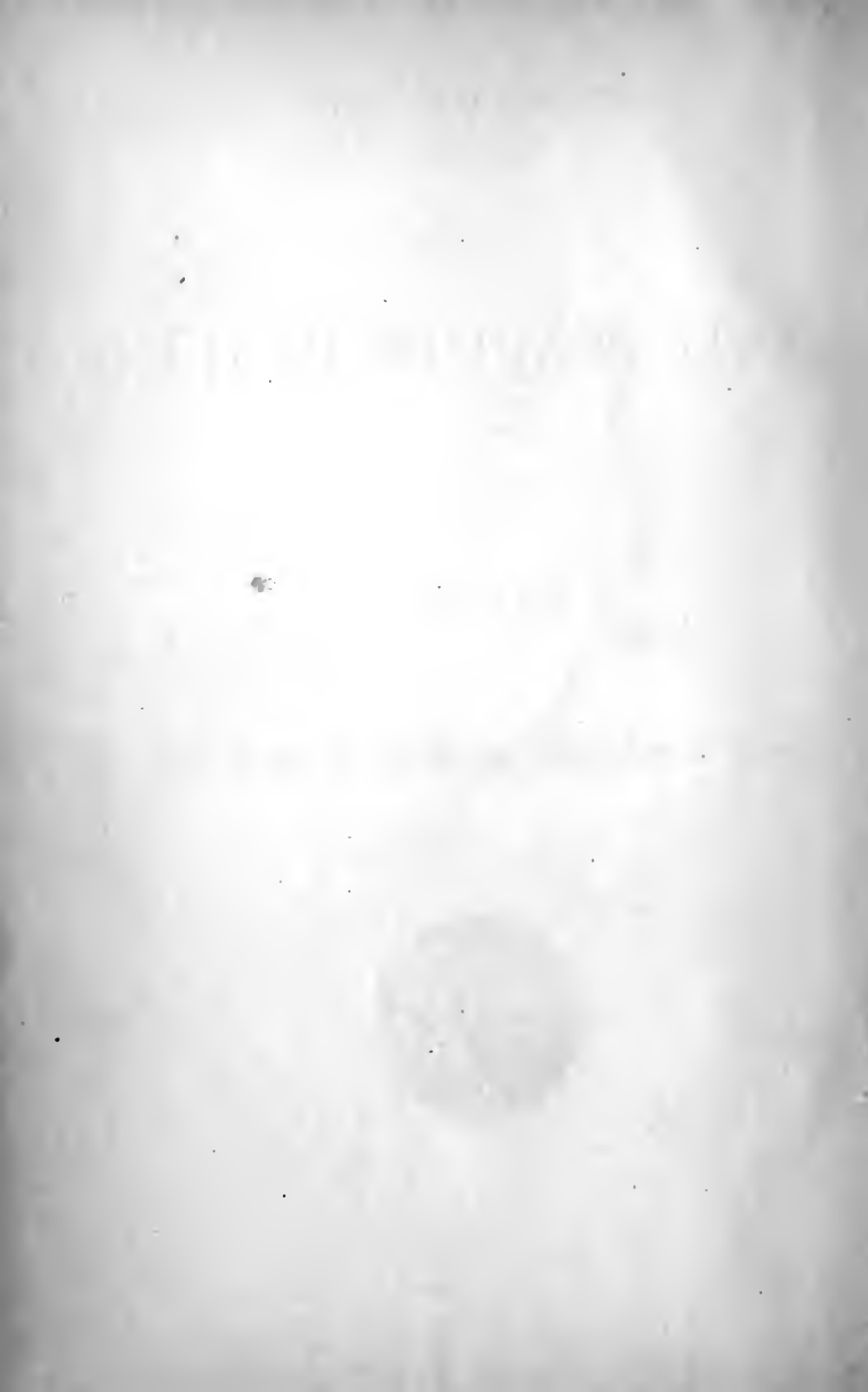
*Nov., 1886.*

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# NINTH BIENNIAL REPORT

OF THE

# STATE BOARD OF HEALTH

OF

CALIFORNIA,—

For the Fiscal Years from June 30, 1884, to June 30, 1886.



C

SACRAMENTO:

STATE OFFICE,.....JAMES J. AYERS, SUPT. STATE PRINTING.

1886.

1886, Nov. 15,  
 Gift of  
 Dr. J. S. Green.

## MEMBERS OF THE CALIFORNIA STATE BOARD OF HEALTH.

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HENRY S. ORME, M.D.	<i>President.</i>	Los Angeles.
GERRARD G. TYRRELL, M.D.	<i>Secretary.</i>	Sacramento.
W. R. CLUNESS, M.D.		Sacramento.
R. BEVERLY COLE, M.D.		San Francisco.
JAMES SIMPSON, M.D.		San Francisco.
J. M. BRICELAND, M.D.		Shasta.
H. C. CROWDER, M.D.		Williams.

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## STANDING COMMITTEES OF THE STATE BOARD OF HEALTH.

1. *On the Salubrity of Public Institutions, Schools, Hospitals, Prisons, Factories, etc.,*

DOCTORS COLE, ORME, AND SIMPSON.

2. *On Statistics relating to Life and Health, Modes of Employment and of Living, and the Comparative Healthfulness of different localities,*

DOCTORS CLUNESS, BRICELAND, AND TYRRELL.

3. *On Intoxicating Liquors, Inebriate Asylums, Pathological Influence of Alcohol, etc.,*

DOCTORS SIMPSON, COLE, AND CROWDER.

4. *On Influence of Irrigation, Tree Planting, etc.,*

DOCTORS CROWDER, ORME, AND CLUNESS.

5. *On Legislative Business,*

DOCTORS BRICELAND, ORME, AND TYRRELL.

On these Committees the Secretary of the Board is ex officio a member.

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# REPORT

OF THE

STATE BOARD OF HEALTH.

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## REPORT OF THE BOARD.

*To his Excellency GEORGE STONEMAN, Governor of California :*

The State Board of Health, in presenting this its ninth biennial report to you and to the Legislature, is glad to be able to say that the sanitary condition of the State for the fiscal year ending June, 1886, has been generally good.

Although threatened, no epidemic disease has invaded our borders.

The Board is now in closer and more regular communication with a greater number of the different municipalities and localities throughout the State, and of the various health organizations of the country, than ever before, and have striven by every means available—having also received the valuable aid of the public press—to keep the people acquainted with the sanitary condition of the State, and at the same time advising them of the importance of studying and observing proper sanitary laws.

The members of your Board have given all the assistance in their power to help bring about this encouraging condition of the public health, and to lay the foundation of future good work. They have been active, harmonious, and zealous in the discharge of their duty.

California was one of the first States in the Union to see the urgent necessity of organizing a State Board of Health, and much good work has been done; but we are forced to admit that California is now far behind some of her sister States in which State Boards of Health are maintained, in failing to have upon her statute books many needed sanitary laws, and having the same carried out by efficacious State aid. As Californians, we are all justly proud of our State, standing, as it does, in the first rank as to intelligence and wealth of her citizens; therefore, such a lax condition of our health laws, so easily remedied, should not be permitted. The State must protect her people in the enjoyment of health and happiness, as well as property. And we are confident that as soon as earnest attention is called to this subject our legislators will quickly place *our State* in the front rank in this as in all other matters appertaining to the public welfare.

As to the financial workings of the Board, the detailed statement of our Permanent Secretary appended, shows that the amount appropriated for the work of the Board has been faithfully and judiciously used; and fortunate has it been for our coast that we have not been visited by any pestilential diseases, such as yellow fever, smallpox, or cholera, during the past two years. If we had been, the limited appropriation at the disposal of this Board, it is feared, would not have been sufficient to have permitted it to maintain such a quarantine as would have proved effective.

### QUARANTINE.

The subject of State quarantine is one of primary importance, and should command the earnest attention of the Legislature, as it has so often of this Board. With ocean steamers almost daily arriving from China and Japan,

from Australia, Mexico, and Central America; with three lines of trans-continental railroads daily discharging their human freight from all parts of the world into California; with cholera prevalent in Southern Europe; with an ever present danger of yellow fever from Mexico; and of both smallpox and cholera from China and the Indies; the situation calls for prompt and active preventive measures. Quarantine grounds should be provided and suitable buildings erected at some point on the Bay of San Francisco, where the passengers and crews of infected ships could be maintained and the sick provided for until all danger of contagion is past. Quarantine stations should also be provided at the points where each train from the East passes the borders of our State, and a careful examination of all passengers should be there made, and if the presence of contagious disease is discovered, the infected should be detained at the station and the cars thoroughly fumigated before being allowed to proceed. Such a quarantine station was established in 1883 and 1884, by this Board, at Yuma, to prevent the introduction of yellow fever from Mexico, and that such a quarantine may have to be reestablished on the line of the Southern Pacific Railroad, is by no means improbable. As guardians, therefore, of the public health, we would say that a contingent fund should be placed by the Legislature at the disposal of his Excellency the Governor, to be drawn upon by him only in case of the approach of an epidemic. For as our Permanent Secretary says in his report, "it is incomprehensible how legislators can be so blind to the interests of California, as to refuse this safeguard, upon which depends the commercial prosperity and the individual security of the people."

As is well known, and as will be seen by examining the carefully prepared and very complete report of our Secretary, this Board at the last regular session of the Legislature tried to have passed certain amendments to the "Laws of Health," as laid down in the Political Code, so as to make them effective and of practical benefit to the people. That attempted legislation failed, but we still have hopes that "these most important measures" may, at the next session of the Legislature, find a place among the enacted laws, for we are now more thoroughly convinced than ever of their necessity, etc.

Among a few of the important measures that ought to receive immediate attention is the subject of Vital Statistics.

The Vital Statistics of California are very incomplete, as regards the registration of births, deaths, and marriages. This should not be so, and is especially due to the insufficiency of the law itself. This should be promptly remedied.

A stringent law ought also to be passed forbidding the burial or cremation of human bodies within the limits of this State, without first having obtained a regular permit, signed by the proper official designated by law for that purpose. As it is now, we have no legal means of proving the death of any person (either for the inheritance of property or the detection of crime) who may have died and been buried outside of one of our incorporated cities or towns.

Compulsory vaccination laws, at least so far as regards school children, should be enacted. The importance of thorough vaccination and revaccination of the people, especially on the appearance of an epidemic of smallpox, cannot be questioned.

We have a State Analyst connected with the State University, but without funds it is impossible for him to do the work required by this Board for the benefit of the people of the State at large. The importance of a proper analysis of the mineral waters of the State, both qualitative and quantitative, of the plants, soil, etc., cannot be overestimated.



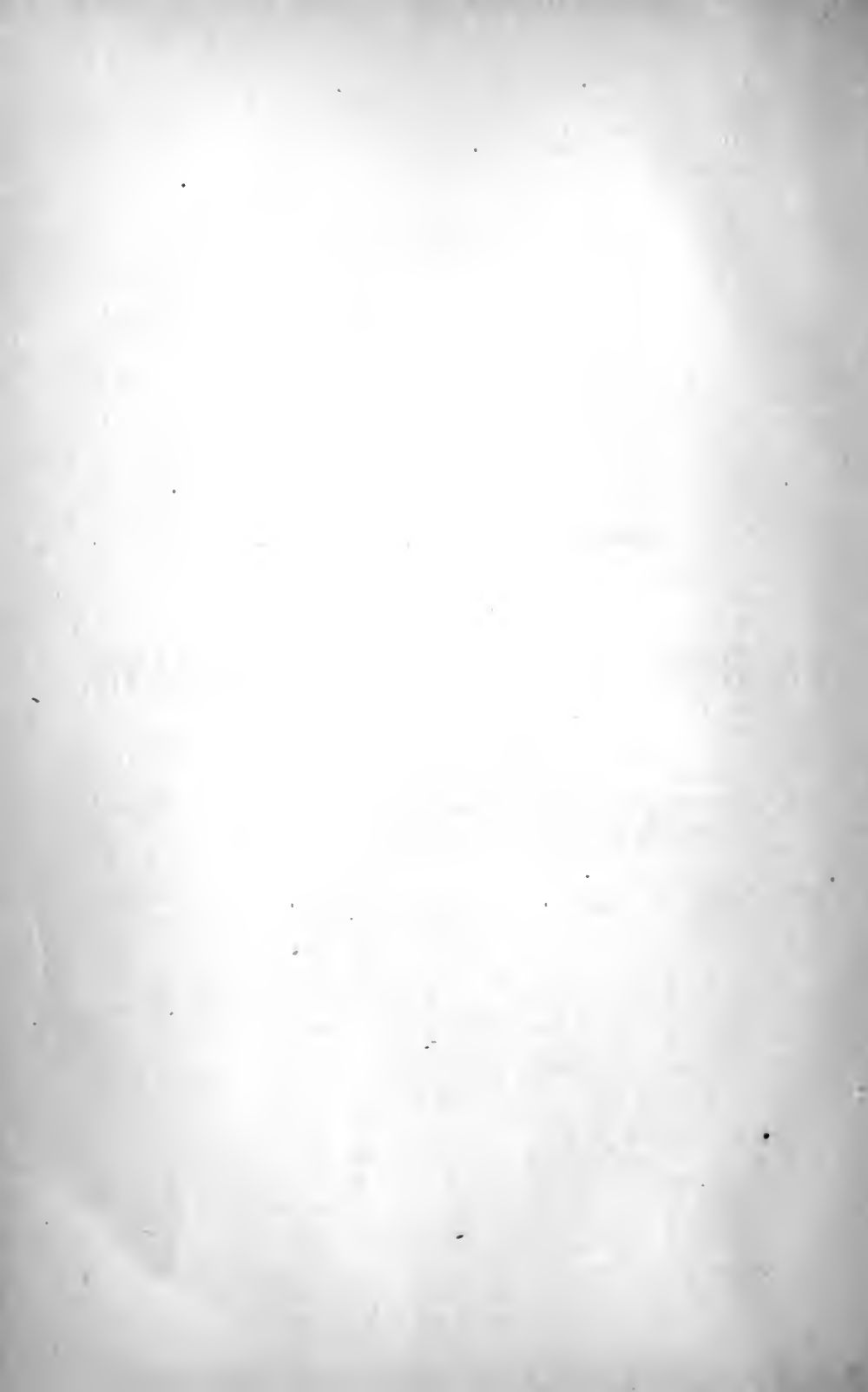
The State Analyst is ready and willing to undertake the task, but he must have the necessary means to properly pursue this great and important work under the direction of the Board.

The subject of local Boards of Health is very important, and can not be too strongly urged. To allow our fellow creatures to suffer and perish through the neglect of the authorities to provide adequate sanitary measures, and to have the same properly carried out, is a crime against humanity no less culpable than that committed by the assassin. Preventive medicine must and will become the medicine of the future, when we educate the people to appreciate it understandingly, and then local Boards of Health will be made compulsory. Supervisors in every county should be made to appoint Health Officers in every incorporated and unincorporated (where none now exist) city, town, village, and township in the State, and those officers, to make their work efficient and of public benefit, should act in harmony and in conjunction with the State Board of Health. As it is now, we have only eight regularly appointed Boards in the State that are effective and require burial permits. Many of our sister States have given this matter careful attention, and have passed very stringent laws in regard to the appointment of Health Boards and Health Officers, and, especially in times of epidemics, they have done good work. Even now, and for years past, complaints are made to our State Board of the prevalence of disease which can only be remedied—"stamped out"—by local health authorities.

The committees appointed by the Board have made reports which will be found of great practical interest, as also several volunteer papers of inestimable value.

In conclusion, the Board finds it especially gratifying to express its appreciation of the Governor's interest in everything pertaining to the departments of public affairs officially intrusted to our hands. His presence at our regular meetings has encouraged us to persistent effort in the face of difficulties; and the State at large shares with us the obligation due to a service faithfully rendered, from the performance of which the pressure of multifarious duties might reasonably furnish an exemption.

H. S. ORME, M.D., President.  
G. G. TYRRELL, M.D., Secretary.  
W. R. CLUNESS, M.D.  
JAMES SIMPSON, M.D.  
R. B. COLE, M.D.  
H. C. CROWDER, M.D.  
J. M. BRICELAND, M.D.



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ABSTRACT OF THE PROCEEDINGS

OF THE

CALIFORNIA STATE BOARD OF HEALTH

AT THE

Quarterly Meetings held during the Thirty-sixth and Thirty-seventh Fiscal Years, ending June 30, 1886.

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# ABSTRACT OF PROCEEDINGS.

## THE REGULAR QUARTERLY MEETING OF THE CALIFORNIA STATE BOARD OF HEALTH,

Was held at the residence of Dr. F. W. Hatch, at the usual hour, July 18, 1884. Present, Dr. Gibbons, Sr., Dr. Cluness, Dr. Hatch, and Dr. Price, the Board's Quarantine Officer, at Yuma, A. T., by invitation.

Dr. Gibbons, President of the Board, in the chair. Dr. Cluness, acting Secretary.

Minutes of last meeting were read and approved.

Communication from M. K. Allen, of the *Sanitary News*, Chicago, Ill., offering to supply each of the members of the Board with a copy of his paper at \$1 50 per copy per annum, was read, and, on motion, the Secretary was requested to forward the publisher's price for six copies.

Letter from United States Consul Willard, of Guaymas, transmitting a copy of monthly consular report, was read and placed on file.

Letter from Dr. J. M. Briceland, a member of the Board, was read and placed on file; also, telegram from Dr. Orme, of Los Angeles, expressing his regret at being unable to attend the meeting of the Board.

Memorandum concerning cholera, from the State Board of Health of New York, was read and discussed, Dr. Henry Gibbons taking strong grounds against the general tenor of the views expressed in the paper.

Dr. Handy's letter regarding yellow fever referred to, expressing conviction that the disease mentioned was yellow fever.

Dr. M. F. Price reported regarding the establishment of quarantine at Yuma, stating that owing to certain circumstances cases of yellow fever, if any should occur, would be first discovered in Arizona, and consequently be beyond our jurisdiction.

There being no further business, the Board adjourned.

W. R. CLUNESS, Secretary pro tem.

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## SPECIAL MEETING OF STATE BOARD OF HEALTH,

Was called and held in the office of the Board at 7:30 P. M., November 22, 1884.

Present—Doctors Orme, W. R. Cluness, H. C. Crowder, and J. M. Briceland.

Dr. G. G. Tyrrell having been appointed by Governor Stoneman a member of the Board, in place of Dr. F. W. Hatch, deceased, presented his credentials, and was invited to a seat in the Board.

The Board then proceeded to reorganize.

Motion was made that Dr. Cluness act as temporary Chairman, and H. C. Crowder as temporary Secretary, which was carried.

Dr. Cluness then informed the Board of the loss it had sustained in the death of its Secretary, Dr. F. W. Hatch, and of its venerable President,

Dr. Henry Gibbons, Sr., which necessitated the election of officers to fill their vacant chairs.

Dr. H. S. Orme, of Los Angeles, was placed in nomination by Dr. H. C. Crowder, to fill the office of President, vice Dr. Gibbons, deceased. Dr. Cluness placed in nomination for the same office Dr. R. Beverly Cole, who had been appointed by the Governor in place of Dr. Gibbons, but who had not then signified his acceptance of the position, being absent in San Diego when appointed, and unaware of the fact; consequently he was not present to take his seat.

Upon a ballot being taken, Dr. Orme received three votes, Dr. Cluness one, and Dr. Cole one. Dr. H. S. Orme having received a majority of all the votes cast, was declared elected; and, on motion, his election was made unanimous.

Dr. G. G. Tyrrell was then placed in nomination for the office of Permanent Secretary, and was unanimously elected.

Dr. Cluness then made some feeling remarks upon the death of Doctors Gibbons and Hatch, and the irreparable loss the Board had sustained in their demise.

Dr. H. C. Crowder moved that a committee of three be appointed to prepare an obituary notice of the late Dr. Henry Gibbons and Dr. F. W. Hatch, which was carried.

Drs. Tyrrell, Crowder, and Cluness were appointed that committee, and instructed to have the report published as an addendum to the biennial report of the State Board of Health, about to be published.

Dr. Cluness stated that the quarantine at Fort Yuma had been discontinued, as its necessity no longer existed. Since this action had been taken, Dr. Cluness had seen Dr. Handy, the quarantine officer at Tucson, and learned from him that yellow fever was quite prevalent in Mexico, and of undoubted character, which opinion was confirmed by Dr. Mattas in some conversation had with him on the subject some time previously. Dr. Cluness had also seen a man connected with the mail service, who related several cases that happened between Tucson and Nogales.

Dr. Handy is of the opinion that quarantine should be established at Tucson, and cannot be commenced too soon.

Dr. Cluness, in consideration of the good offices of the Southern Pacific Railroad Company, and Wells, Fargo & Co., in the care exercised by them in keeping yellow fever out of California, moved that the thanks of this Board be extended to the officers and men of the Southern Pacific Railroad Company, and to those of Wells, Fargo & Co., for their prompt action in sustaining the efforts of the California State Board of Health to protect our fair State from the yellow plague, and that the thanks of this Board are especially due to Superintendent John A. Muir and Medical Officer Doctor John C. Handy for the efficient manner in which they carried out the wishes of the Southern Pacific Railroad Company in preserving quarantine on the premises under their jurisdiction. Carried.

Dr. H. C. Crowder moved that this Board accept the action of Drs. Orme and Cluness in raising the quarantine at Fort Yuma. Carried.

The Secretary was instructed to look after the quarantine bill which was introduced at the last meeting of the Legislature, and especially congressional legislation for quarantine ground in the Bay of San Francisco.

Dr. Cluness moved that a circular be issued by the Board, relative to the necessity of general vaccination, in anticipation of an epidemic of small-pox, which may be expected upon this coast at no distant day. Carried.

It was moved and seconded that the salary of Permanent Secretary for

the past month be drawn in favor of Dr. W. R. Cluness, Acting Secretary, for the period from October 16 to November 22, 1884. Carried.

There being no further business, upon motion the Board adjourned, to meet in regular session, January, 1885.

GERRARD G. TYRRELL,  
Permanent Secretary.

#### REGULAR QUARTERLY MEETING CALIFORNIA STATE BOARD OF HEALTH.

Was held in the office of the Secretary January 15, 1885.

Present—Dr. H. S. Orme, President; Doctors Cluness, Crowder, Brice-land, Cole, Simpson, and Tyrrell, members; and by invitation, his Excellency Governor Stoneman, Rev. J. H. C. Bonté, Secretary University of California, Senator A. W. Saxe, Dr. W. B. May, and Hon. E. W. Maslin.

The minutes of the last meeting having been read and approved.

Doctors Cole and Simpson having been appointed by the Governor members of the Board, presented their commissions, and were cordially welcomed to their seats.

The subject of quarantine in the Bay of San Francisco, and the necessity of legislative action in furtherance of that object, was then discussed.

Dr. Simpson gave a synopsis of the endeavors had from time to time to obtain quarantine in San Francisco Bay, and mentioned among other things that probably the sum of \$600,000 would be appropriated by Congress for sanitary purposes, and that by well directed and persistent efforts a portion of that sum might be obtained by the Board for the use of San Francisco.

Dr. R. B. Cole thought that the necessity for quarantine should be first discussed.

Dr. H. S. Orme replied, that in former meetings of the Board the matter had been fully considered, and the necessity of quarantine determined upon.

His Excellency Governor Stoneman gave a short history of the measures introduced into the last Legislature by his direction, both for an hospital for the insane and for efficient quarantine, and their failure of passage, either through the apathy or indifference of those to whom these measures were intrusted. The Governor spoke very favorably of Angel Island as a suitable place for quarantine purposes.

Dr. R. B. Cole, in expressing his opinion upon the subject, thought that upon proper representation to the United States Government, it would set apart sufficient land from its reserves to subserve the purpose of quarantine in San Francisco Bay, and that this Legislature should be asked for an appropriation for the purpose of erecting suitable buildings upon the land, and not only should this appropriation be large enough to erect these buildings, but in sufficient amount to quarantine the whole State, if such action should become necessary. He therefore moved that a committee of three be appointed, who shall take such bills as have been presented to the Legislature upon the subject of State quarantine, and draft from them and engraft upon them such measures as will accomplish the purposes desired.

Dr. Jas. Simpson was of the opinion that the better way to obtain the means of carrying out the desire of the Board, would be to get the sum required put into the general appropriation bill, and draft a bill after the design of the quarantine bill of New York, which was most carefully drawn,

and present it to the Legislature. He also thought it most important that the subject be urged upon Congress, as it is through it alone that land can be procured for the purpose named; and, in furtherance of this object, thought that a member of this Board ought to be sent upon this special mission to Washington, to confer with the authorities there, and impress our representatives with the urgent necessity that exists for prompt action in the premises.

The Secretary was then instructed to read the report of the Commissioners ordered by President Hayes, consisting of Colonel Chas. Sutherland, Surgeon U. S. A., John Van Sant, U. S. M. H. S., and G. W. Woods, Surgeon U. S. N., to investigate the existing quarantine regulations of the port of San Francisco, and also to consider the recommendation for a suitable site for the establishment of a national quarantine station, should such station be deemed necessary. When the reading was finished, Dr. Briceland made some remarks upon the subject, and took occasion to recapitulate and eulogize the work of the late Secretary, Dr. F. W. Hatch, in the pursuance of the question of quarantine, and assured the Board that they would find it no easy matter to convince legislators of the necessity of protection from disease. When in the Legislature himself he succeeded in getting plenty of promises of help, but when the time for action came opinion changed, and the thought was that when disease did come it was time enough to do something to arrest it. He, however, congratulated the Board in having as a friend, such an efficient colaborer in the field of science as Senator Saxe, from Santa Clara, whom he was happy to see present with us to-night. He was an intelligent, honest man, that appreciated the necessities of effective guards against disease, and with his aid the Board might, perhaps, hope to gain those concessions to science and good government which had hitherto been denied them. He therefore asked Dr. Saxe, Senator from Santa Clara, to express his views upon the question of quarantine, as he believed that we are threatened with severe epidemic disease in the coming Summer, and that now is the time to prepare for it.

Dr. R. Beverly Cole seconded the desire to hear from Dr. Saxe, and also thought that now was the time for action. He appreciated the difficulty of getting an appropriation from the Legislature, but believed that with the coöperation of Dr. Saxe such an appropriation will be made.

Senator Saxe, in response, then briefly expressed his views, and assured the Board of his earnest sympathy in all matters appertaining to the health of the State. The matter of quarantine is attracting the attention of the entire country, and suggested that a bill be presented providing that all lepers imported into this State should, within six months of their discovery, be returned to the place from which they came, at the expense of the State. Provision, he thought, should be made not only for local quarantine, but means should be taken to arrest disease upon the borders of the State, or wherever else within its boundaries it may appear. For his own part he was most willing to coöperate with the Board, and introduce and urge any bill upon the subject which they desired.

Governor Stoneman, after some remarks upon the subject of quarantine, favored the Board with an extract from his coming message to the Legislature upon this very question, and in it strongly urged the necessity of protecting this coast from infection from foreign nations and adjoining territories, and recommended an appropriation from the Legislature for that purpose.

Dr. Cole's motion was then put and carried unanimously.

Dr. Orme appointed Doctors Cole, Simpson, and Cluness the committee.

Dr. H. C. Crowder moved that a committee be appointed to confer with



the local Board of Health of San Francisco upon the general quarantine bill, and invite their coöperation in aiding its passage and carrying out its provisions; it was also suggested by Governor Stoneman that the support of the Board of Trade, Chamber of Commerce, and other similar organizations be enlisted in furtherance of the perfection and passage of such bill or bills.

The motion was carried unanimously.

Dr. Crowder then moved that the committee already named to prepare the bill, be the committee to interview and secure the coöperation of the San Francisco Board of Health, and other organizations interested in the sanitary welfare of the State. Carried.

Dr. W. B. May was quite interested in the matter of quarantine, and was pleased to say that he would gladly coöperate with the Board in any legislative action they might deem best for the safety of the State.

Dr. R. B. Cole moved that the locality named by the Commission ordered by President Hayes, viz.: the cove to the north of Peninsula Point, in Raccoon Straits, be the preference of this Board, which was carried.

Dr. James Simpson moved that it is the sense of this Board that an appropriation of not less than \$50,000 be made for the purpose of preventing the introduction and spread of disease in our midst, by the erection of suitable quarantine buildings, the establishment of efficient quarantine where needed, and any other measures necessary for the maintenance of public health, and the due efficiency of the State Board of Health, which was carried unanimously.

On motion, the Secretary was instructed to confer with the Hon. E. W. Maslin upon the amendment of the law relating to births, marriages, and deaths, whereby it may be made efficient, and answer the purpose for which it was designed.

The Rev. J. H. C. Bonté, Secretary to the University of California, proposed that if we succeeded in having a State Analyst appointed, as suggested by the Board, or one to whom the chemical examination of adulterated food or drugs, or the mineral waters of the State, be referred for analysis, that the Chemist of the University of California would undertake that duty, under instruction from the State Board of Health, through its Secretary.

The members of the State Board were agreed upon the necessity of such an officer, and thanked Mr. Bonté for the suggestion offered.

The Secretary was also instructed to confer with Mr. Maslin upon the preparation of a bill to be introduced into the Legislature, making vaccination compulsory upon the children before entering the public schools of the State.

There being no further business, upon motion, the meeting then adjourned.

GERRARD G. TYRRELL,  
Permanent Secretary.

#### THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH,

Was held in Sacramento, April 18, 1885, at the hour of 8 o'clock P. M.  
Present—Dr. H. S. Orme, President; Doctors Cole, Cluness, and Tyrrell; and, by invitation, his Excellency Governor Stoneman and Hon. E. W. Maslin.

The minutes of the last meeting having been read and approved, the

Secretary read a communication from Doctor J. M. Briceland, giving the reason for his inability to be present at the meeting.

The first business of the evening was the appointment by the President of the regular standing committees.

The following were appointed as

COMMITTEES OF THE STATE BOARD OF HEALTH.

1. On the Salubrity of Public Institutions, Schools, Hospitals, Prisons, Factories, etc.—Doctors Cole, Orme, and Simpson.
  2. On Statistics relating to Life and Health, Modes of Employment and of Living, and the Comparative Healthfulness of different localities—Doctors Cluness, Briceland, and Tyrrell.
  3. On Intoxicating Liquors, Inebriate Asylums, Pathological Influence of Alcohol, etc.—Doctors Simpson, Cole, and Crowder.
  4. On Influence of Irrigation, Tree Planting, etc.—Doctors Crowder, Orme, and Cluness.
  5. On Legislative Business—Doctors Briceland, Orme, and Tyrrell.
- On these committees the Secretary of the Board is ex officio a member.

And the Secretary was directed to notify each absent member of his appointment.

The Secretary then read a communication from Dr. H. G. Baldwin, of Arizona Territory, asking for the appointment of Quarantine Officer at Yuma, stating that he was informed from reliable sources that yellow fever was present in Sonora, Mexico.

On motion, the communication was received and placed on file, and the Secretary directed to inform Doctor Baldwin that no Quarantine Officer would be appointed at present.

Dr. Orme stated that he had conversed with some gentlemen from that section of the country, but could obtain no positive information of the prevalence of yellow fever at this time.

Dr. Cole wished to know from his Excellency the Governor if the Board had any power to obtain the means of protecting the State from the invasion of infectious or contagious diseases, now that the Legislature had refused to appropriate any funds for that purpose.

Governor Stoneman replied that there was no fund at his disposal for that purpose, and no way of obtaining it except by proclamation calling upon each county to levy a tax for that especial purpose, and then such tax would be under the control of the county levying, and would not be available by the State Board of Health except by and with the consent of such county.

After some further discussion of this subject, it was moved that:

WHEREAS, The Legislature of the State of California, at its last session, having failed to make the necessary appropriation for quarantine purposes to protect the State from the invasion of contagious or infectious diseases, therefore, it was

*Resolved*, That Dr. R. Beverly Cole, a member of the Board, during his contemplated visit East, in attendance upon the American Medical Association, be authorized and instructed to confer with the authorities at Washington, D. C., and with the National Board of Health, with reference to obtaining from them such assistance in establishing quarantine on the borders of this State as may become necessary; and,

*Further*, That this Board request his Excellency George Stoneman, Governor of this State, to give his indorsement and sanction to this authorization.

It was also,

*Resolved*, That Dr. R. Beverly Cole, a member of this Board, when in Washington, D. C., be authorized and instructed to exert himself to the end of obtaining from the General Government quarantine grounds as recommended by the Commission ordered by President Hayes and reported upon July, 1882. And,

*Further*, That his Excellency George Stoneman, Governor of this State, be requested to indorse the above resolution.

Both of which resolutions were adopted, and the Secretary requested to prepare credentials in accordance therewith.

On motion, the Secretary was authorized to purchase a cabinet, the property of the late Dr. F. W. Hatch, for the use of the Board, for the purpose of filing away papers, preserving blank forms, etc., at a cost not to exceed forty dollars. Carried.

It was, on motion,

*Resolved*, That the Secretary be instructed and authorized to prepare, and distribute generally, circulars to the people upon the subjects of cholera, smallpox, and yellow fever.

Carried.

On motion, it was

*Resolved*, That any assessments due the American Health Association be paid, and a copy of their proceedings obtained for the use of the Board.

Carried.

There being no further business before the Board, on motion, the meeting adjourned.

GERRARD G. TYRRELL,  
Permanent Secretary California State Board of Health.

#### THE REGULAR QUARTERLY MEETING OF THE CALIFORNIA STATE BOARD OF HEALTH,

Was held in Sacramento, July 29, 1885, at 8 o'clock P. M.

Present—Dr. Orme, President: Doctors Briceland, Crowder, Cluness, Cole, Simpson, and Tyrrell. Governor Stoneman was present by invitation. The minutes of the last meeting were read and approved.

The Secretary presented a bill from the *Sanitary News* for a renewal of subscription for the ensuing year. After some discussion among the members, it was, on motion,

*Resolved*, That but one copy of the *Sanitary News* be subscribed for, which will be sufficient for the library.

Dr. Cole moved, which was seconded by Dr. Cluness, that the Board subscribe for seven copies of the *Sanitary Engineer*, one for each member of the Board, which was carried unanimously.

The Secretary read a communication from Dr. J. H. Miller, of Redding, Shasta County, regarding the duties of unincorporated towns in the matter of compensating Health Officers, and asking an expression of the Board upon this subject.

Dr. Briceland was of the opinion that this Board had no power to interfere with the action of local Boards. It would likewise be beyond its province, as the Political Code provides for the duties and powers of local Boards of Health, and the compensation of Health Officers.

Dr. Simpson thought that while it was the aim and object of this Board to encourage sanitation, and to foster and sustain all efforts in this direction, yet we ought to be very careful not to interfere with the action of local Boards in managing the details of their office.

It was then moved that the communication of Dr. Miller be placed on

file, and the Secretary be directed to answer it in the manner indicated by this Board, which motion was unanimously carried.

The Secretary read a communication from Dr. Boughton, of Benicia, asking to have a Health Officer appointed for that place. This communication was addressed to Dr. Cole.

The Secretary explained that he also had a communication from Dr. Boughton upon the same subject, and answered it by saying that this Board had no power to appoint Health Officers, and sent him a copy of the law upon the subject.

Dr. Cole hereupon replied, that under these circumstances he would ask the return of Dr. Boughton's letter, which he would answer personally.

In answer to a communication from Dr. Lassing, of New York, the Secretary was directed to exchange publications with him.

The Secretary then read a communication from Dr. E. C. Rhodes, complaining of the sanitary condition of Bartlett Springs, and asking that several copies of the circular upon cholera be sent to him for distribution.

The communication was placed on file, and the Secretary instructed to call attention to the sanitary condition of the Summer resorts in his next monthly circular, and also transmit the circulars upon cholera as requested.

Dr. Cole moved that this Board solicit a copy of the transactions of the Pennsylvania State Medical Society, containing the report of Dr. Shakespeare upon the Plymouth epidemic, and that the Secretary utilize it in his next circular to the public. Carried.

A communication was read from Dr. Wolfred Nelson, late of Panama, regarding yellow fever and its presence in Mazatlan, Hermosillo, and other towns in Mexico, and promising to communicate with the Secretary if he discovered the disease progressing toward California.

On motion of Dr. Cole, the thanks of the Board were directed to be returned to Dr. Wolfred Nelson for his valuable communication upon yellow fever, and a request be made that he continue to correspond with the Board upon this and other subjects appertaining to the welfare of California. Carried.

The Secretary begged leave to report that in accordance with a resolution passed at the last quarterly meeting of the Board, he had prepared and printed a circular entitled "Facts for the People Concerning Cholera," of which an edition of twenty-five thousand copies was printed and distributed throughout the State. In addition, a circular letter was prepared and sent to the editors of the different newspapers in the State, asking their coöperation in the dissemination of the circular, and calling attention to its contents. This letter was, without exception, favorably received and responded to by every newspaper receiving it. Many papers published our circular in its entirety, and all gave copious extracts or editorially called attention to it. Indeed, one paper, the *Tuolumne Independent*, circulated six hundred copies as a supplement to the paper. To the press this Board is under many and deep obligations for the kind, generous, and noble manner in which it has always seconded its efforts to improve the sanitary condition of the people and advance the welfare of the State. Especially has it done all in its power to bring the subject of cholera under the notice of the people, and the necessity of perfect cleanliness to insure the safety of the State from its invasion.

The monthly circular issued by this Board is now distributed regularly to the leading papers of the State and all Health Boards in the United States and Canada, as well as to the correspondents of the Board. The newspapers very generally republish copious extracts from it as a matter of news interesting to the public.

Your Secretary also, in compliance with the orders of the Board, has paid forty dollars to Dr. Hatch, Jr., for the cabinet in use by the late Secretary, and the sum of thirty-two dollars and forty cents for a full set of the publications of the American Public Health Association, for the use of the Board.

Your Secretary has also opened a correspondence with Dr. Wolfred Nelson, now traveling in Mexico, with a view of obtaining reliable information of the progress of yellow fever in that country, and adopting such means as may be advisable to prevent its incursion into California. The Secretary has also to report that he has corresponded with the Recorders of different counties, and finds that the Registry Law is in most of them a dead letter, and would, therefore, respectfully suggest that the Board take this matter into consideration, with a view of so amending the law that the Vital Statistics of the State may be collected with regularity and accuracy; and as a preliminary to this, that a law be enacted forbidding the interment of any human body without a permit from some duly appointed officer. The Secretary's report was received and his action approved.

Dr. J. M. Briceland moved that the thanks of this Board be returned to the press for the very generous manner in which it has assisted the State Board of Health in disseminating sanitary knowledge among the people, which motion was unanimously carried.

Dr. Briceland moved for Dr. Cole's report when east on the business of the Board.

Dr. R. B. Cole, in response, said that he had no written report, but would state verbally that upon visiting Washington he first and very naturally sought the Secretary of the National Board of Health, and through him learned that that Board was only such in name, owing to the same cause that was crippling the efficiency of the California Board of Health—failure of the Legislature to provide funds for its maintenance. He then visited Surgeon-General Hamilton upon the subject of quarantine, who explained to him satisfactorily that the whole subject of quarantine was under the control of the Marine Hospital service, and that, in his last report to that Board he had strongly urged the claims of California to protection. There is a fund of \$300,000 provided if urgent necessity requires its use. This fund is, however, subject to the call of the President, and cannot be used except by and with his consent, and only then in case of great necessity. Dr. Cole then called upon President Cleveland, who received him cordially, and evinced great interest in the sanitary welfare of California, and regretted that our Legislature had been so short-sighted as to leave unprovided with funds a Board so essential to the welfare of the State as the Board of Health. He was, however, impressed with the necessity of taking some means of protecting the State if seriously threatened with epidemic disease, and promised that upon representation from our Board of the necessity of protection, made to Surgeon-General Hamilton, he would do all in his power to have a portion of the emergency fund placed at our disposal; and further promised to aid and assist any measure introduced into Congress for the purpose of more efficiently protecting our State by proper quarantine.

Dr. Jas. Simpson moved that the thanks of this Board be returned to Dr. Cole for the efficient manner in which he had discharged the duties intrusted to him, which was unanimously carried.

It was moved and seconded that a committee of two be appointed to draft a bill upon quarantine, to be reported at our next quarterly meeting. Carried.

The President appointed Doctors Cole and Simpson as such committee.

with authority to confer with any legal gentlemen for advice upon the subject.

After some desultory conversation upon the subject of quarantine and its necessity, there being no further business, upon motion, the meeting adjourned.

G. G. TYRRELL, M.D.,  
Permanent Secretary California State Board of Health.

## THE REGULAR QUARTERLY MEETING OF THE STATE BOARD OF HEALTH,

Was held in Sacramento, October 12, 1885, at 8 o'clock P. M.

Present—Dr. H. S. Orme, President; Doctors Cole, Crowder, Tyrrell, and later, Dr. Briceland.

The meeting having been called to order, the minutes of the last meeting were read, and on motion approved.

The Secretary then read a copy of a letter sent by Secretary Manning, regarding the establishing of quarantine on this coast, which was ordered to be placed on file.

Dr. R. B. Cole, in referring to his interview with President Cleveland upon the subject of quarantine, desired to say that the President requested that a personal letter be sent him upon this subject toward the end of October or the beginning of November, lest through the pressure of other business the matter should escape his attention. Dr. Cole expressed his intention of writing to President Cleveland as requested.

The Committee on Quarantine Bill reported progress, but were unable to have the bill prepared for presentation to the Board at this session. The committee promised, however, to have a copy of the bill sent to each member of the Board for his criticism and remarks before forwarding it to Congress.

Dr. Cole desired to know if the Secretary had any official communication upon the subject of yellow fever on our southern borders, or what means, if any, had been taken to protect the State from the incursion of this disease.

The Secretary replied that no official communication had been received, except such as was contained in the consular reports received from the National Board of Health in Washington, and the consular reports from the Consul in Guaymas, Mexico.

Dr. Cole moved that the Secretary place himself in communication with Dr. Benjamin R. Carmen, in Mazatlan, to have him keep us informed as to the progress of yellow fever throughout the country, and to give us the names of men whom he could recommend as being efficient inspectors under the United States Marine Hospital Service for services on the borders of our State. Furthermore, that he request Dr. Carmen to give us, to the best of his knowledge, the professional status of Dr. McHattan, of Mazatlan.

Dr. Orme suggested that the names of M. Kieselback, Guaymas, Sonora, and Pedro Davila, Hermosillo, Sonora, be added, and written to for information.

This suggestion was acceded to by Dr. Cole, and the motion was carried.

Dr. Cole then moved that the Secretary, upon obtaining the information sought, shall be authorized, if in his judgment the information is sufficiently important, to call a special meeting of the Board to take such measures as it may deem necessary to obtain efficient quarantine.

The motion was adopted.

Dr. H. C. Crowder moved that the Secretary keep himself in communication with the Secretaries of the State Boards of Health, East, in regard to the progress of smallpox, with a view of establishing the same measures of quarantine, should it become necessary; which was carried.

Dr. Crowder moved that the thanks of the Board be returned to the Secretary, for the efficient manner in which he compiles the "Monthly Circular," and especially that for the month of September, and desires him to have an additional supply printed, and inclose one copy to every newspaper in the State, with a request that it publish the concluding paragraph of the circular, regarding smallpox; which was unanimously carried, and the suggestion adopted.

After some desultory conversation upon the best means of rendering the State Board of Health more effective, by increasing its legal power, and devising some measures by which the vital statistics of the State may be more fully obtained, there being no further business, on motion, the meeting adjourned.

G. G. TYRRELL,  
Permanent Secretary California State Board of Health.

#### THE REGULAR QUARTERLY MEETING OF THE CALIFORNIA STATE BOARD OF HEALTH,

Was held in Sacramento, January 12, 1886, at 8 o'clock P. M.

Present—Dr. H. S. Orme, President; G. G. Tyrrell, Secretary; Dr. R. B. Cole, Dr. James Simpson, Dr. H. C. Crowder, Dr. J. M. Briceland, Dr. W. R. Cluness, members; his Excellency Governor Stoneman and Hon. T. H. Thompson, Secretary of State, by invitation.

The minutes of the last meeting having been read and approved, the Secretary read a communication from M. Kieselback, of Sonora, in reply to a letter sent him in relation to yellow fever, by direction of the Board, in which he declined to give any information, upon the plea that as he was a merchant and a foreigner, it would not be to his interest to do so.

The Secretary also read a letter from Dr. R. B. Carmen, of Rosario, Sinaloa, he having removed from Mazatlan, in reply to a communication sent him by order of the Board, regarding the progress of yellow fever in Mazatlan and the Mexican border; in which the doctor, in the most graphic manner, described the wretched sanitary condition of the towns named, and the utter disregard of all sanitary precautions against the dissemination of disease. He believed that yellow fever, a hitherto unknown disease in that part of the country, had now become a regular visitor and was in fact beyond extermination, and that hereafter we would have to constantly guard our frontier.

Dr. Cole moved that the communication be received and placed on file, and that the thanks of the Board be returned to Dr. Carmen for his interesting and instructive letter, and that he be requested to communicate with this Board whenever any event arises which in his opinion would be of value to us as information which would put us on our guard against the encroachment of epidemic disease; which was carried.

The Secretary then called the attention of the Board to a circular from the American Public Health Association, asking contributions from all Boards of Health to defray the necessary expenses involved in the work of the Committee on Disinfectants.

After some discussion upon the power of the Board to apply its funds to that purpose, and it being unanimously agreed upon that the work referred to was eminently in the interest of Boards of Health, and for their benefit and the States they represent, it was therefore, on motion,

*Resolved*, That the communication from the American Public Health Association be received and placed on file, and that the sum of twenty-five dollars be forwarded by the Secretary to the Treasurer of the American Public Health Association, as a contribution towards enabling its committee to complete its work upon disinfectants.

Which was carried.

The Secretary then read a communication from Professor Rising, the State Analyst, in reference to analyzing mineral waters without compensation, which was, on motion, received and placed on file.

The next business in order being the subject of quarantine, and the reading of the proposed bill, Dr. R. B. Cole, one of the committee on the subject, desired to remark before reading the bill, that, as he had heretofore mentioned, he had written upon the subject to President Cleveland, and had a reply from Colonel Lamont, saying that his letter had been received and that the President would give the subject his closest attention. Dr. Cole further stated, that he had a conversation with U. S. Senator Stanford upon the subject, and also with Congressman Henley, and both promised their joint support of the measure.

Dr. Jas. Simpson, in a lucid manner explained the reasons of certain provisions in the bill, so as to give the least friction in local matters, and by its simplicity to, as far as possible, disarm hostile criticism.

The Secretary then read the bill as follows:

AN ACT TO ESTABLISH A QUARANTINE STATION AT THE PORT OF SAN FRANCISCO.

*Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled:*

THAT, WHEREAS, The Port of San Francisco is peculiarly liable to the incursions of infectious and contagious diseases from South American, Pacific Island, and Asiatic ports, and it is desirable to establish a well appointed quarantine station thereat;

Now, therefore, there is hereby appropriated out of any money in the treasury not otherwise appropriated, such sum, not exceeding one hundred thousand dollars, as may be necessary to purchase grounds and erect buildings suitable for quarantine purposes at the Port of San Francisco. The same shall be forthwith expended, for the purpose aforesaid, under the direction of the Secretary of the Treasury.

The said quarantine grounds and buildings, when completed, shall be under the supervision of the Marine Hospital service at said port. The use thereof, from time to time, may be granted by the authorities of said hospital to the Health Departments of the City and County of San Francisco or State of California, upon condition that the said Health Departments, or either of them, assume the expense of maintaining the same.

After some discussion upon the general features of the bill, and obtaining the opinion of his Excellency Governor Stoneman, with his approval of the measure, it was, on motion of Dr. H. C. Crowder,

*Resolved*, That the bill be adopted as read, and presented to our Representatives in Congress assembled.

Which was carried.

On motion of Dr. Crowder, it was further

*Resolved*, That the State Board of Health request his Excellency the Governor to authorize the printing of six hundred copies of the bill, to be held by the Secretary, and none of them to be distributed outside the limits of the Board until the bill had been presented to Congress, and then to forward to each member of the House of Representatives a copy of the bill.

Which was carried.



Dr. Cole moved that the Secretary, in forwarding the bill to our Senators and Congressmen, accompany the same with a letter asking their coöperation and favorable consideration of the bill, and requesting their earnest efforts in behalf of its passage when it comes before them.

Which was unanimously carried.

On motion of Dr. H. S. Orme, it was

*Resolved*, That the thanks of this Board be tendered to each and all of our numerous correspondents who so generously devote their time and labor to supplying our Secretary so efficiently and regularly with their monthly reports of deaths and prevailing diseases, and that the Secretary be instructed to convey this sentiment to his correspondents, and to request their continued aid in carrying out the work of the Board, and their acceptance of its thanks.

Which was carried unanimously.

There being no further business to come before the Board, on motion of Dr. Briceland, it adjourned.

G. G. TYRRELL,  
Permanent Secretary California State Board of Health.

#### THE REGULAR QUARTERLY MEETING OF THE CALIFORNIA STATE BOARD OF HEALTH,

Was held in Sacramento, April 19, 1886, at 8:30 P. M. Present: Dr. Orme, President; Dr. R. B. Cole, Dr. James Simpson, Dr. H. C. Crowder, Dr. J. M. Briceland, Dr. W. R. Cluness, Dr. G. G. Tyrrell, members, and Hon. Ed. Maslin, by invitation.

The minutes of the last meeting were read and approved.

The Secretary reported that he had duly forwarded the amount voted at the last meeting, to the American Public Health Association, received acknowledgment, and the thanks of the Secretary.

The Secretary then read a letter from the Secretary of the National Board of Health, Washington, in reference to the bill forwarded by this Board to our Representatives in Congress, asking quarantine station, and the Secretary's reply, which was satisfactory to the National Board. The members of the State Board expressed satisfaction that no misunderstanding was permitted to exist regarding its relations with the National Board of Health.

The Secretary then read a communication from the American Public Health Association regarding the publication of the Lomb Prize Essays, etc.

On motion of Dr. Cluness, seconded by Dr. H. C. Crowder, the Secretary was instructed to order eight copies of Lomb's Prize Essays on sanitary matters for distribution among the members, which was carried.

The Secretary read a communication from Dr. W. D. Groton, relative to the cases of trichiniasis recently under his care, which was ordered embodied in the biennial report, and the thanks of the Board returned to Dr. Groton.

Dr. R. B. Cole then read a communication from Congressman Henley, regarding the quarantine bill, and promising his cordial support of the measure in the House of Representatives.

Senator Stanford had likewise indorsed the measure, and at the request of Dr. Cole had already introduced the bill in the Senate, where it was referred to the appropriate committee.

It was therefore, on motion,

*Resolved*, That the Secretary be instructed to write an official letter to Senator George Hearst, and call his attention to the fact that a quarantine bill had been introduced into the Senate of the United States; that it has the indorsement of the National Board of Health, the United States Marine Hospital Service, the Medical Society of State of California, the State Board of Health, the San Francisco Board of Trade, and the general community, and that his active coöperation and assistance in passing the bill through the Senate in the interest of the public health upon this coast will be looked upon with favor by all parties, and tend to promote confidence in the people that the inroads of contagious disease will be prevented if possible.

Which was carried unanimously.

On motion of Dr. Simpson, it was

*Resolved*, That a committee of three, composed of Doctors Briceland, Cluness, and Tyrrell, be appointed a committee to revise the law providing for the establishment of a State Board of Health, by increasing its legal powers, and enabling it to have a local Board of Health established in every county of the State, under a penalty which will compel obedience, and that the assistance of the Honorable Ed. Maslin be obtained to give such legal assistance and advice as may be necessary in the premises.

Carried.

The various committees appointed to prepare reports for the biennial report reported progress, and were all confident of obtaining such information upon the subjects designated as may be useful for the welfare of the public.

The Secretary reported that no epidemic disease at present threatens the State, with the exception of that at Panama, where yellow fever is reported quite prevalent and exceedingly fatal. We rely upon the vigilance of the health authorities in San Francisco to watch carefully the shipping arriving from the Isthmus, and enjoin a strict quarantine if any suspicious developments take place.

Drs. Simpson and Cole advocated the necessity of having an appropriation from the Legislature this Winter, so that we may be prepared for any emergency that may arise.

Drs. Briceland, Crowder, and Cluness joined in the discussion of this subject, and the feeling was unanimous that by urging the matter persistently legislation might be obtained.

There being no further business before the Board, the meeting adjourned.

GERRARD G. TYRRELL,  
Permanent Secretary California State Board of Health.

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REPORT OF THE PERMANENT SECRETARY

TO THE

STATE BOARD OF HEALTH.

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## REPORT OF THE PERMANENT SECRETARY.

*To the State Board of Health:*

GENTLEMEN: In presenting this, the biennial report of the State Board of Health, your Secretary has to regret its many imperfections in matters appertaining to the vital statistics of the State. This is owing to many causes beyond the control of your executive officer, the most potent one being the impossibility, under the existing law, of collecting trustworthy records. This we may hope to correct in time, as public interest in sanitary matters increases. But during the long continued illness and subsequent death of your late efficient Secretary, Dr. Hatch, the imperfection of the law manifested itself in the most striking manner. As you are aware, it is the duty of the County Recorders to transmit to the Secretary of the Board of Health a copy of all the births, deaths, and marriages in their respective counties, but as this was not possible for them, from the fact that no person, with few exceptions, ever registered births or deaths in their offices, the Secretary of the Board of Health was obliged to collect these statistics from voluntary contributors. In the midst of this occupation disease was silently making its inroads upon the health of Dr. Hatch, and the work he was doing become onerous.

Sickness is at all times a disqualifying agent in the transaction of business which requires constant vigilance and attention to sustain the interest of voluntary contributors to a work which is appreciated by few, and almost thankless. How much more so when that sickness of months was accompanied by extreme debility and ever-increasing prostration, rendering each act performed a sacrifice of strength and a quicker movement toward eternity. Under such a trial we cannot wonder that the records of the year 1884 are imperfect. Those of the earlier part of that year were lost, mislaid, or never recorded, and those of the latter half of the year—which I was fortunate enough to secure—were so few and imperfect as to give a very uncertain estimate of the mortality of those months. At the period of Dr. Hatch's death, the machinery of the Board had become disarranged, the intelligent hand that had hitherto guided its working had ceased to labor, his last biennial report had been made, to him time was no more, and all registration had come to an end.

The loss this Board had sustained in the demise of its distinguished Secretary was quickly followed by the no less severe misfortune in the sudden death of its venerable President, Dr. Henry Gibbons—a man whom the Board held in highest reverence and esteem, whose prudent counsels and clear foresight enabled it to meet emergencies with judicial wisdom. At this time the Board had still to meet another loss in the resignation of Dr. Chester Rowell, who by having accepted a Federal position thereby became disqualified from holding a State office. The Board was now bereft of three of its most valued officers, all men of experience as sanitarians and thoroughly imbued with the importance of the work in which they had been engaged. Under these circumstances it became necessary for the con-

tinued efficiency of the Board, that the vacancies should be promptly filled. Accordingly, his Excellency Governor Stoneman appointed Doctor James Simpson and Dr. R. Beverly Cole, of San Francisco, and Dr. G. G. Tyrrell, of Sacramento, to occupy the seats made vacant by death and resignation. After the reorganization of the Board, the election of Dr. H. S. Orme as President, and the selection of myself as Secretary, it became evident upon looking into the affairs of the Board that the material which might have been utilized in continuing the work of my predecessor was in such a disjointed condition, and the records of the office so scattered, that but very little of it was available. The correspondents of the Board being unknown it was a matter of impossibility to obtain a renewal of their reports: therefore your Secretary, in order to ascertain certain facts connected with the welfare of the Board, issued the following circular to every county in the State, and to the more prominent medical men residing therein, in the hope that a complete list might be obtained of those willing to coöperate with the Board in its desire to possess the fullest information possible of the sanitary condition of the State; and, also, to learn to what extent the requirements of the law governing Boards of Health had been observed:

OFFICE OF THE CALIFORNIA STATE BOARD OF HEALTH, {  
SACRAMENTO, December 8, 1884. }

Owing to the long continued illness of Dr. F. W. Hatch, late Secretary of the California State Board of Health, the mortuary returns from the different localities in the State to the Board of Health have not been as complete as they ought to be, and as required by the provisions in the Political Code designed for that purpose. In order to perfect these returns and establish permanent communication throughout the State between the different counties and the State Board of Health, whereby vital statistics may be collected and utilized for the advancement of sanitary science and the general welfare of the community, I will esteem it a special favor if you will answer at your earliest convenience and as fully as possible the following questions:

1. Has a Board of Health been established in your city (or town)? Ans. —.
2. Is the Board organized under Chapter II, Article V, Section 3061 of the Political Code, approved March 19, 1878, or under the provisions of the city (or town) charter? Ans. —.
3. How is the Board constituted? Ans. —.
4. Are meetings of the Board regularly held? Ans. —. If so, how often? Ans. —.
5. Has a Health Officer been appointed? Ans. —.
6. Have health ordinances been adopted, and are they enforced, looking to the improvement or preservation of the sanitary condition of your city (or town)—such as the cleansing of privies, vaults, and other foul places? Ans. —.
7. Have reports been made by your Board of Health to the State Board, as required by Section 3061 of the State law, of *deaths* and epidemic, contagious, or infectious diseases? Ans. —.
8. Has your Board of Health adopted any ordinance requiring a certificate of death to be filed, and a burial permit to be obtained, before the interment of a deceased person shall be allowed? Or is there any such ordinance now in force in your city (or town)? If not, what means have you of ascertaining death, or causes of death, in the community? Ans. —.
9. If no such Board has been established, or Health Officer or Sanitary Inspector appointed, will you, upon the receipt of proper blanks furnished for that purpose, ascertain the number of deaths and causes thereof in your city, town, or vicinity, and transmit the same monthly to the Secretary of the State Board of Health, in Sacramento? Ans. —.
10. Will you notify the Secretary of the State Board of Health of any epidemic, infectious, or contagious disease in your city, town, or vicinity, that direct investigation may be made into its cause, advice given, or, if possible, remedies suggested to mitigate or arrest the advance of the disease? Ans. —.
11. What is the present estimated population of your city (or town)? Ans. —.

Respectfully submitted to the State Board of Health.

G. G. TYRRELL, M.D., Permanent Secretary.

To this circular over a hundred replies were received, which demonstrated the fact that in but few instances had the law, requiring incorporated cities and towns to establish local Boards of Health, been observed, and in still fewer instances had a Health Officer been appointed in lieu

thereof. Another fact was ascertained by this circular, which has an important bearing upon the mortuary statistics of the State, and that is that in eight only of those cities or towns having organized Boards of Health is a permit required for the burial of a deceased person. In every other city, town, or village heard from, no permission from any regularly constituted authority was required to inter a dead body, neither was the cause of death required to be ascertained. If, however, the undertaker kept a list of those he interred, he generally inquired of the physician the cause of death, and recorded it. This was, however, entirely voluntary on the part of both undertaker and physician, no law existing on our statute books requiring a permit for burial, except by local ordinance in incorporated cities.

Another fact was elicited in the replies to this circular, and that was the general desire of the medical profession on this coast to aid and assist the State Board of Health in the promotion of sanitary measures, and in the collection of mortuary statistics. Among the whole number of medical men from whom replies were received, there was but one who refused to correspond with the Board except he was compensated for the trouble; and one who refused upon the ground that the sooner an epidemic destroyed the inhabitants of the town in which he lived the better; and lest the conveyance of the information of an outbreak of epidemic disease might mar that result, he declined to notify the Board if such should occur. With these two exceptions a most cheerful compliance with the desire of the Board for information was promised and expressed. Accordingly, I supplied some hundred and twenty-four gentlemen with postal cards, for deaths and prevailing diseases, from whom I receive reports every month.

An attempt was made to obtain a complete list of all the deaths occurring in each county, by applying to the County Recorders, who, according to law, are required to transmit to the Secretary of the State Board of Health a trimonthly statement of all the births, marriages, and deaths registered in their office. It was soon ascertained that while the Recorders were willing to do their duty in the premises, they had no records to transmit, and in some counties not a single death had been recorded for years. The Legislature of 1884 being now in session, your Secretary, in hope of having this gross violation of a plain provision of the law rectified, prepared the following amendment to the law relating to the registry of births, marriages, and deaths, and expected that if he succeeded in having it placed upon the statute book a record of births, marriages, and deaths would be a possibility, and by a little attention might be made a probability or a decided success:

AN ACT TO AMEND SECTIONS THREE THOUSAND AND SEVENTY-SEVEN, THREE THOUSAND AND SEVENTY-EIGHT, AND THREE THOUSAND AND EIGHTY-TWO OF AN ACT ENTITLED "AN ACT TO ESTABLISH A POLITICAL CODE," APPROVED MARCH TWELFTH, EIGHTEEN HUNDRED AND SEVENTY-TWO, RELATIVE TO THE "REGISTRY OF BIRTHS, MARRIAGES, AND DEATHS."

*The People of the State of California, represented in Senate and Assembly, do enact as follows:*

SECTION 1. Section three thousand and seventy-seven of said Act to establish a Political Code is amended so as to read as follows:

3077. All persons registering marriages, births, or deaths, must, at the close of every month, file with the County Recorder a certified copy of their register. All such certificates must specify, as near as may be ascertained, the name in full, age, occupation, term of residence in the city or county, birthplace, condition, whether single or married, widow or widower, sex, race, color, last place of residence, and cause of death of all decedents; and of births, the sex and color of the child, and name and nationality of its parents. Any person so registering in accordance with this section, and filing the same with the County Recorder, who shall give a certificate of the same, which shall be sufficient evidence

of the duty having been performed, shall, upon presentation of the Recorder's certificate to the Board of Supervisors, be entitled to a compensation of twenty-five cents, to be allowed by the Board of Supervisors, and paid out of the General Fund of the county, for each and every birth, marriage, or death so recorded.

SEC. 2. Section three thousand and seventy-eight of said Act to establish a Political Code is amended so as to read as follows:

3078. If, at any birth, no physician or midwife attends, the parents must make the report, and shall be entitled to the same compensation as other persons performing like service in the manner prescribed in section three thousand and seventy-seven.

SEC. 3. Section three thousand and eighty-two of said Act to establish a Political Code is amended so as to read as follows:

3082. Any person, on whom a duty is imposed by this chapter, who fails, neglects, or refuses to perform the same as herein required, is liable to a penalty of fifty dollars for each and every offense, to be recovered by the District Attorney of the proper county for the use of the General Fund of such county, when notified by the Secretary of the State Board of Health that such reports have failed, or were neglected to be returned to his office by the County Recorder, or when notified by the County Recorder that such returns have not been filed with him, or when he has reason to believe that any births, marriages, or deaths have not been returned as required by this Act.

SEC. 4. This Act goes into effect immediately.

As will be seen, the amendments consist in—

*First*—Having every person registering births, marriages, and deaths file *monthly* a certified copy of their register.

*Secondly*—In paying for each birth, death, or marriage so recorded the sum of twenty-five cents, which is a small pittance, but still enough to insure performance of the duty.

*Thirdly*—For a failure to perform this duty, it shall devolve upon the Secretary of the State Board of Health to notify the District Attorney to commence suit against the County Recorder, if he is derelict; and it shall be the duty of the County Recorder to notify the District Attorney to prosecute those whose duty it is to register births, marriages, and deaths, if they fail to do so within the time stipulated. This bill was introduced by Dr. Saxe, Senator from Santa Clara, through whom it was thought it could be enacted into law, as of the greatest importance to the sanitary interest of the State, and also as one of vital interest to the welfare of the community, as without a perfect record of the births, marriages, and deaths it will be impossible to show the effect of our climate in reference to the causes which abridge or prolong life, or to ascertain the amount of sickness, or mortality, or the comparative prevalence in certain localities of endemic disease; as we know that local influences differ much in various places, and certain seasons; some are comparatively healthy and some extremely unhealthy. By a general, full, and accurate registration these and numberless other facts might be definitely ascertained to the great benefit of the community and to the lessening of our mortality list. Another point of vast importance is that as our State increases her population, so is the greater necessity of having a record of vital statistics, which for their accuracy may be relied upon in establishing the right to or the just distribution of property. Cases have happened in this State where persons have failed in securing their lawful title to property because of the impossibility of supplying the missing link in the chain of evidence which accurate registration would infallibly have supplied. An accurate registration of vital statistics would also solve many questions regarding the social condition of communities and the progressive change in the habits and practices of peoples. The value of the accumulated and systematized facts so obtained would in business relating to life insurance and annuity companies be invaluable, and as a means of detecting crime a proper registration of every death occurring in the State would obviate or unmask many a foul murder, whether at the hands of the abortionist, the quack, or the willful murderer. The almost universal practice now in vogue in this State of allowing the burial of the



dead without let or hindrance, is simply offering an inducement to crime, and should not longer be permitted to exist without correction. It is of paramount importance then to every well ordered Government "to establish such a system of registration of all vital statistics of any importance as shall enable it, both for the present and the future, to know its own life history and the influences that are molding it for better or for worse as the years pass by." With these objects in view the present law was sought to be amended. I regret, however, to say that the bill for this purpose never got beyond its first reading, although favorably reported for passage by the Judiciary Committee, more energy being required to pass any such salutary measure, in which no monetary issue was involved, than the introducer of the bill was able to give it.

About this time a bill was introduced by Senator G. Whitney, which read as follows:

Whenever, by existing law or by ordinance of any incorporated city, or city and county, or by ordinance or resolution of the Board of Supervisors of any county, a permit is required from a Board of Health, Health Officer, or other authorized officer or person, before depositing or burial in any cemetery of any human body, such permit shall not be granted without the production and filing with such Board of Health, Health Officer, or other authorized officer or person, a certificate signed by a physician or a Coroner, or two reputable citizens, setting forth as near as possible the name, age, color, sex, place of birth, occupation, date, locality, and cause of death of the deceased. And no certificate shall be received upon which to grant such permit unless signed by a physician, Coroner, or two reputable citizens, registered as such under his proper signature at the office of such Board of Health, Health Officer, or other authorized officer or person.

This bill before its passage I sought to have amended, by inserting a clause requiring that no person or persons shall inter in any city, or city and county, or in any county in this State, any human body, without first having obtained a permit from some authorized officer or person. This amendment likewise met with disaster, as the author of the bill feared that the insertion of this clause would cause some controversy over his measure, which he sought to avoid, as its passage was desired in the particular interest of the City of Oakland, which he represented. Foiled in this endeavor, I thought that I possibly might be able to get a bill passed amending the Code, making it incumbent upon the Board of Supervisors of each county to appoint a Health Officer for every unincorporated city, town, or village, of five hundred or over inhabitants. The Act was as follows:

AN ACT TO AMEND SECTION THREE THOUSAND AND SIXTY-TWO OF AN ACT ENTITLED AN ACT TO ESTABLISH A POLITICAL CODE, RELATING TO BOARDS OF HEALTH.

SECTION 1. Section three thousand and sixty-two of the Political Code is amended so as to read as follows:

3062. The Board of Supervisors of each county must appoint in each unincorporated city or town of five hundred or more inhabitants, a Health Officer, with all the duties and powers of the Board of Health and Health Officer, as specified in this article and in the two preceding articles.

SEC. 2. This Act shall take effect immediately.

This bill was also intrusted to Senator Saxe; was referred to the Judiciary Committee, and reported favorably. It reached its first reading, but further than this the introducer of the bill failed to push it. It was now very evident that nothing could be done in the way of amending our laws in regard to the registration of births, marriages, and deaths during the session of the Legislature of 1885. The further attempt was therefore reluctantly abandoned.

I thought, however, that although I had failed in getting such amend-

ments to the law as thought needful in this matter, it might be possible to pass a bill making vaccination compulsory on all children attending the public schools, and thus insure an entering wedge to make the law general. With this end in view I drafted the following bill, which was modeled upon that now existing as law in the State of New York:

AN ACT TO ENCOURAGE AND PROVIDE FOR A GENERAL VACCINATION IN THE STATE OF CALIFORNIA.

*The People of the State of California, represented in Senate and Assembly, do enact as follows:*

SECTION 1. The Trustees of the several common school districts in this State, and the proper local Boards of common school government in the several cities, towns, and villages of the State, are hereby directed and empowered, under the provisions hereinafter set forth, to exclude from the benefits of the common schools therein, any child or any person who has not been vaccinated, and until such time when said child or person shall become successfully vaccinated.

SEC. 2. The said Trustees, or local Board, may adopt a resolution to carry into effect the power conferred by the first section hereof; and whenever they shall do so, they shall give at least ten days' notice thereof, by posting the same in two or more public or conspicuous places within the limits of their school governments, and shall, in said notice, advertise due provision for the vaccination of any child or person of suitable age who may desire to attend the common school, and whose parents and guardians are unable to procure vaccination for them, or for the children of suitable age of such parents as by reason of poverty may be exempted from taxation in such school district.

SEC. 3. The said Trustees or Board may, in their or its discretion, appoint some competent physician and fix the compensation for his services, the duty of which physician shall be to ascertain the number of children or persons in the school district or subdivision of city school government, being of age suitable to attend the common school, who have not been already vaccinated, and also to furnish to the said Trustees or said Board, a list of the names of all such children or persons. It shall also be the duty of said physician to provide himself with good and reliable vaccine virus, wherewith to vaccinate such of the number of children or persons aforesaid as have not been vaccinated according as the Trustees or Board shall direct, and to thereupon give certificates of vaccination when said physician has, by personal examination, assured himself of the success of the vaccination, which certificates shall be evidence thereof for the purposes of a compliance with section first hereof.

SEC. 4. The necessary expenses incurred by the provisions of this Act shall be included and collected in the annual tax bill of the district, town, village, or city, as may be proper according to law.

SEC. 5. The Trustees of the several school districts of this State are hereby required to include in their annual report, and report to the Secretary of the State Board of Health, the number in their several districts between the ages of five and twenty-one years who are vaccinated, and the number unvaccinated.

SEC. 6. This Act shall take effect immediately.

This bill was also introduced by Senator Saxe, was referred to the Judiciary Committee, reported back favorably, and its passage recommended. Dr. Saxe succeeded in having it read twice, but, unfortunately for the sanitary interest of the State, it was allowed to remain without further action, and died of inanition.

Thus far all attempts to amend our registration laws, or improve the existing health laws, or introduce others, have utterly failed. Whether this was owing to my lack of experience in the ways of legislators, want of interest or energy on the part of the learned gentleman to whom was confided the carriage of the bills, or ignorance on the part of the legislators themselves upon questions of sanitation, I am unable to say. The fact, however, remains, that from one or all of these causes, the State Board of Health, through its executive officer, has been unable to effect those measures of legislation which it believes would have been in the interest of and for the good of the whole people of this State.

In accordance with instructions from this Board, and in compliance and conformity with a resolution of the Medical Society of the State of California, passed by that body in April, 1884, your Secretary drafted a bill asking the appointment of a State Analyst and Chemist for the purpose of

examining officially the mineral waters of the State, and also the adulterations which we believe to be mixed with our food and drugs. The bill is as follows :

AN ACT TO PROVIDE FOR ANALYZING THE MINERAL WATERS AND OTHER LIQUIDS, AND THE MEDICINAL PLANTS OF THE STATE OF CALIFORNIA, AND OF FOODS AND DRUGS, TO PREVENT THE ADULTERATION OF THE SAME.

*The People of the State of California, represented in Senate and Assembly, do enact as follows:*

SECTION 1. The Governor of the State of California shall appoint one of the Professors of the State University of California of sufficient competence, knowledge, skill, and experience as State Analyst, whose duty it shall be to analyze all articles of food, drugs, medicines, medicinal plants, mineral waters, and other liquids or solids which shall be manufactured, sold, or used within this State, when submitted to him, as hereinafter provided.

SEC. 2. The State Board of Health and Vital Statistics or medical officers of health of any city, town, or of any city and county, or county, may, at the cost of their respective Boards or corporations, purchase a sample of any food, drugs, medicines, medicinal plants, mineral waters, or other liquids offered for sale in any town, village, or city in this State, and submit the same to the State Analyst as hereinafter provided, and said Analyst shall, upon receiving such article duly submitted to him, forthwith analyze the same and give a certified certificate to the Secretary of the State Board of Health submitting the same, wherein he shall fully specify the result of the analysis; and the certificate of the State Analyst shall be held in all the Courts of this State as prima facie evidence of the properties of the articles analyzed by him.

SEC. 3. Any person desiring an analysis of any food, drug, medicine, medicinal plant, soil, mineral water, or other liquid, shall submit the same to the Secretary of the State Board of Health, together with a written statement of the circumstances under which he procured the articles to be analyzed, which statement must, if required by him, be verified by oath; and it shall be the duty of the Secretary of the State Board of Health to transmit the same to the State Analyst, the expenses thereof to be defrayed by said Board.

SEC. 4. The State Analyst shall report to the State Board of Health the number of all the articles analyzed, and shall specify the result thereof to said Board annually, with full statement of all the articles analyzed and by whom submitted.

SEC. 5. The State Board of Health may submit to the State Analyst any samples of food, drugs, medicines, medicinal plants, mineral waters, or other liquids for analysis, as hereinbefore provided.

SEC. 6. It shall be competent for the Mineralogist of the State of California to submit to the State Analyst any minerals of which he may desire an analysis to be made; *provided*, that the cost of the same shall be defrayed by the Mineralogical Bureau.

SEC. 7. The Board of State Viticultural Commissioners shall have the same privileges as are provided for the State Board of Health under this Act, with respect to samples of wines and grape spirits, and of all liquids and compounds in imitation thereof, and any person or persons desiring analyses of such products shall submit the same to the Secretary of the said Board of State Viticultural Commissioners, and the same shall be transmitted to the State Analyst in the manner prescribed in section three of this Act. The analyses shall be made and the certificate of the State Analyst shall be forwarded to the Secretary of the said Board of State Viticultural Commissioners, and shall have the same force and effect as provided for in section two of this Act, with respect to analyses made for the State Board of Health.

This bill having many friends in the Senate, and being energetically advocated by the Rev. Mr. Bonté, the efficient Secretary of the University of the State of California, as a measure tending to confirm the great medicinal value of the numerous mineral springs in this State, and also as a means of protecting the general public from the many fraudulent adulterations of foods, condiments, drugs, etc., which so vitiate their quality as to render them detrimental in many instances, it received the sanction of the Legislature and passed into a law, which has now been in operation for some time. The measure has not as yet produced sufficient definite results upon which to form an opinion as to its future usefulness. It is, however, expected that during the ensuing year some valuable work will be done in this direction, which will exhibit in a satisfactory manner the necessity which existed for the creation of the office. At present the medicinal properties and curative value of several of our favorite mineral springs are but vaguely guessed at, no satisfactory analysis having been officially made

of them, or their hygienic value determined. This is a part of the work to be undertaken, and when properly and systematically carried to completion, and all the prominent mineral springs in the State analyzed accurately and definitely recorded, the value of such a record will be almost incalculable, as it will at once establish, what we now believe to be a fact, that we have within the borders of this State a series of mineral springs that will rival, if not excel, any of those so famous in the Eastern States and on the Continent of Europe for their medicinal virtues and curative properties.

#### CHOLERA.

The Board having in view its duty "to take cognizance of the interests of health and life among the citizens generally," and believing from the inroads that cholera was making on the continent of Europe, that we were in some danger from the advent of that dreadful disease upon our coast, instructed your Secretary to prepare a circular upon the subject, enjoining upon the citizen the necessity of perfect sanitation as one of the best barriers to the introduction or progress of the disease. In accordance with these instructions, your Secretary prepared and distributed twenty-five thousand copies of the following circular:

##### *Preventable Disease Circulars.*

##### FACTS FOR THE PEOPLE CONCERNING CHOLERA.

The Legislature of the State of California, during its last session, 1885, having, with the utmost indifference to the sanitary welfare of the people, in utter disregard of the suggestions offered by his Excellency Governor Stoneman, in his biennial message, and equally regardless of the importunities of the State Board of Health, refused to appropriate a single dollar to protect the State from the invasion of infectious or contagious diseases; therefore, in view of the possibility, or rather the probability, of *cholera* extending its ravages to the Pacific Coast this Summer, the State Board of Health deem it prudent to offer to the public a few words of warning as to the necessity of the early employment of sanitary measures, to arrest the development of disease or mitigate its virulence if, unfortunately, it should appear among us.

Cholera being essentially a *preventable* disease, all questions concerning its cause, diffusion, and prevention, must interest the people of this coast just now, when Europe is again the theater of its manifestations; and as all preventive measures are based upon the assumption that the virus or germ of the disease is a living organism capable of transmission through water, food, clothing, or personal contact, and like all living matter, is itself susceptible of death, the prevention of its dissemination, or the means of its speedy destruction, are the desiderata to be sought.

*Cholera* upon these shores is a foreigner, and has never yet visited us, except by importation, and then only after ample warning. Last year the warning came to us from France and Italy; this year it comes from Spain and the shores of the Mediterranean. How soon it may reach New York or other seaports upon the Atlantic border is a question of time. It is sure to come along the highway of travel, and once landed on our shores will make its way across the continent quite speedily. Had the question of quarantine, efficiently exercised, been entertained by the last Legislature, and provision made for its maintenance, we believe we could have kept cholera, yellow fever, and smallpox out of California. The highway is now open, and we must expect to reap the fruits of the criminal negligence, ignorance, and stupidity of our law-makers.

*What can be done in the way of prevention locally?* Much may be done if the officers of health, or the properly constituted authorities, do their duty. Cholera, as was said before, is a preventable disease; its habitat is among a crowd; it revels in filth and decomposing organism, but failing to find suitable conditions for its growth and maintenance it dies out. Consequently, the very first thing to be done is for each individual to see that *his* house, outhouse, and yard is put into a good sanitary condition. Do not wait for any health officer, see to it *yourself*. Have your drains cleaned out and flushed with water; your privy or cesspool emptied and disinfected immediately. See that your cellar is cleared of all decaying substances, have it thoroughly whitewashed, and all filth, rags, etc., burned. If you have a well see that the water thereof is not contaminated by drainage from the house or outhouses. If you have the slightest suspicion that it is, boil the water before using, or better still, shut up that well and dig another away from all chance of such contamination. If you use river water, which is always more or less polluted, see that it is boiled before drinking it, and you will save your health for the trouble. Avoid crowding in sleeping rooms. See that each room is properly ventilated, nothing being so conducive to disease as an overcrowded and ill-ventilated apartment. Plenty of

fresh, pure air, pure water, and wholesome food, with household and personal cleanliness, will do more to prevent the access of cholera to your dwelling than all the supplications of the credulous, or the nostrums of the charlatan. While there is danger of cholera, or, indeed, any epidemic disease, developing in your midst it is an act of prudence to avoid excessive fatigue from any source, as the system when tired or exhausted is much more liable to infection, and less able to resist it, than in any other conditions. It is also indispensable that the stomach and bowels be kept in a healthy state by avoiding all unripe fruit, decaying vegetables, fish, flesh, or any food that is not perfectly sweet and fresh. Temperance in all things should be enjoined, and especially in alcoholic beverages, as it is found by experience that the intemperate, or those addicted to drinking intoxicating fluids habitually, are the first to die in an epidemic of cholera. Nature knows no mercy in dealing with the violators of Nature's laws; if her laws are transgressed the punishment is swift and certain. Food should not be kept in the same room with the sick from any infectious disease; neither should that unconsumed by the sick be used by others, but either burned or disposed of in some other equally safe way.

If cholera should appear in your dwelling, the first thing to do is to isolate the patient, put him into a comfortable room without carpets and with as little furniture as is consistent with comfort, disinfect immediately all discharges from the body, and either burn or bury them; do not throw them into either privy or cesspool to poison your family or your neighbors; see that the patient has medical attendance promptly; do not wait ten or twelve hours to see if he will get better—delay in cholera means death. Cholera always gives warning of its approach by premonitory diarrhoea; this is the favorable opportunity to arrest the disease; the attack is then under the control of medicine judiciously chosen and administered; a few hours delay and it will have passed from comparative safety into extreme danger, perhaps beyond the power of remedies to save; act, then, promptly and intelligently, and a valuable life may be rescued from a fatal illness.

If there is no medical man within easy call, and a person be attacked with premonitory diarrhoea, place him in bed at once, apply warmth to the feet, a mustard poultice over the abdomen, and give a teaspoonful of paregoric (which is to be found in every family) every hour until your medical attendant arrives. Do not give, indiscriminately, stimulants—brandy, red pepper, camphor, ginger, etc., advised by busybodies; wait for skilled medical advice—more people are killed by quackery and meddlesome trifling than by disease.

If traveling, avoid as much as possible using urinals or water-closets at railway stations; if not properly taken care of and daily disinfected they are constant sources of infection.

Remember that cholera is always, in this country, imported; it seeks crowds, and follows, as a rule, the line of travel; railway companies and lines of transportation generally should see that all urinals, water-closets, and baggage-rooms belonging to the company, or about their premises, are daily cleansed, purified, and disinfected.

#### DISINFECTION AND DISINFECTANTS.

*Disinfection* is the destruction of the poisons of infectious or contagious diseases. *Deodorizers*, or substances which destroy smells, are not necessarily disinfectants, and disinfectants do not necessarily have an odor. *Disinfection* can not compensate for want of cleanliness or of ventilation.

#### DISINFECTANTS TO BE EMPLOYED.

*Roll Sulphur* (brimstone), for fumigation; this is a cheap and efficient substance for fumigating rooms; it is positively destructive to disease germs, when efficiently used.

*Sulphate of Iron* (copperas), dissolved in the proportion of one and a half pounds to the gallon of water, is a cheap and reliable deodorizer and antiseptic for privies, cesspools, sewers, etc.

*Sulphate of Zinc*, in the proportion of four ounces of sulphate and two ounces of common salt to the gallon of water, is efficient and harmless for clothing, bed linen, blankets, etc. It should be used boiling hot, and the articles to be disinfected plunged into it and thoroughly boiled.

*Corrosive Sublimate*, in the proportion of a quarter of an ounce to the gallon, is an unsurpassed germicide and disinfectant, but has the disadvantage of being excessively poisonous, and therefore dangerous for general use.

*Carbolic Acid* is of uncertain strength, is expensive, and experience has shown that it must be employed in comparatively large quantities to be of any use. It is also liable, by its strong odor, to give a false sense of security.

#### HOW TO USE DISINFECTANTS.

**I. In the sick room.** The most available agents are fresh air and cleanliness. The clothing, towels, bed linen, etc., should, on removal from the patient, be placed in a tub of the zinc solution, boiling hot if possible. All discharges from the patient should either be received in vessels containing the copperas or corrosive sublimate solution, or, if this is impracticable, should be covered with the solution. Unnecessary furniture, especially that which is stuffed, carpets, and hangings, should be removed from the room at the outset, if possible; otherwise they should remain for fumigation and treatment.

**II. Fumigation with sulphur** is the only practicable method of disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which can not be treated with the zinc solution, should be

opened and exposed during fumigation, as directed below: Close the rooms as tightly as possible, stopping up every crevice and keyhole; place the sulphur in iron pans, supported upon bricks placed in washtubs containing a little water, set it on fire with alcohol or kerosene sprinkled upon it, and allow the room to remain closed twenty-four hours. For a room ten feet square at least two pounds of sulphur will be required; for larger rooms proportionately larger quantities will be necessary.

III. *Premises, cellars, yards, stables, gutters, privies, cesspools, water closets, sewers, drains*, should be liberally treated with the copperas solution; it is cheap and effective, and may save your life. The copperas solution may be easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

IV. *Body and bed clothing.* It is best to burn all articles which have been in contact with persons sick of infectious or contagious diseases. Articles too valuable to be destroyed should be treated as follows: *Cotton, linen, flannels, blankets*, etc., should be treated with the boiling hot zinc solution, introduced piece by piece; secure thorough wetting, and boil for half an hour. *Furs, silks, heavy woolen clothing, bed covers, and beds*, which cannot be thus treated with the zinc solution, should be hung in the room during fumigation, their surfaces fully exposed, and their pockets turned inside out; afterwards they should be hung in the open air, beaten, and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out, and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterwards be removed to the open air and thoroughly shaken and beaten.

V. *Corpses* should be washed thoroughly with the zinc or corrosive sublimate solution, then wrapped in a sheet wet with the solution, and buried at once. Metallic or metal-lined coffins should be used when possible, and *always* when the body is to be transported for any considerable distance.

If these notes of warning and guides to action are heeded, and fear does not usurp the place of common sense, we have little to dread from cholera personally. It is the unthinking multitude, the selfish egotist, the "wait-until-it-comes" people, that we have to fear. "An ounce of prevention is worth a pound of cure," and there is no disease to which this aphorism so aptly applies as *cholera*.

By order of the Board.

GERRARD G. TYRRELL, M.D.,  
Permanent Secretary State Board of Health.

SACRAMENTO, April 24, 1885.

N. B.—Copies of this circular for free distribution can be had on application to the Secretary.

In addition to this circular the following letter was addressed to the press, and a copy sent to the editor of every newspaper in the State, together with a copy of the circular inclosed:

SACRAMENTO, April, 1885.

DEAR SIR: As the late Legislature, by its disgraceful parsimony in sanitary matters, has rendered it impossible for the State Board of Health to distribute generally throughout the State the accompanying circular, and as the information contained therein is wholly in the interest of the people, the State Board of Health is reluctantly compelled to appeal to the generosity of the press to give the contents of this circular that publicity which it alone can do.

By publishing in your paper such extracts as you may deem pertinent to the subject, and calling attention to the necessity of immediate sanitation in your town or city, and the advisability, nay, necessity, of a house to house inspection, you will materially aid the cause of humanity, and oblige,

Yours truly,

G. G. TYRRELL, M.D.,  
Secretary of State Board of Health.

Copies for distribution can be had by application to the Secretary.

The effect of this was to enlist the coöperation and active assistance of the press, and in the most generous and unprecedented manner the subject-matter of the circular was given a wide diffusion. As a result, a general hygienic preparation was made throughout the State to receive the expected but unwelcome visitor, and had we been so unfortunate as to have realized our expectations by the importation of cholera into our midst, I am confident that the efforts made at the instigation of this Board, and with the coöperation of the press, to cleanse and purify the different cities, towns, and villages of this State, must have averted much of the virulence of the plague, deprived it of many of its horrors, and saved hundreds of lives that, under other conditions, would have fallen easy victims to the disease.

## YELLOW FEVER.

During the latter part of the year 1885, yellow fever again made its appearance in Mazatlan and other places upon the Mexican border. As this was a direct menace and a source of uneasiness to our State, it was determined to make an effort to obtain reliable information as to its progress and the extent of its virulence. Accordingly, a letter was addressed to Dr. Wolfred Nelson, who had lately returned from a prolonged residence in Panama, and whose unquestionable familiarity with the disease and his known skill in treating it, would make his opinion valuable and trustworthy, asking him to communicate to the Board his personal knowledge regarding the presence of yellow fever in Mexico, and the likelihood of its reaching this State overland or otherwise. This he very kindly did in the following letter:

GRAYMAS, MEXICO, July 16, 1885.

MY DEAR DOCTOR: During my stay in Mazatlan, from the twenty-fifth of June to the twelfth of July, there has been a number of cases of yellow fever, with three deaths. I send you two newspapers, with two deaths marked. The day I left Mazatlan there were two cases of yellow fever in the military hospital. I am told that the steamships sailing from Mazatlan are provided with clean bills of health. *Verbum sapienti.* I have also made careful inquiry here, and believe this place (Guaymas) to be free of the disease at the present writing. There is a rumor that the disease has reappeared at Hermosillo, the Capital of this State. I know nothing of its truth. As no restrictions are placed on commerce in the Gulf of California, with steamers constantly plying between infected ports, it may be carried about. It was epidemic in 1883, August to December, and killed nine hundred persons in Mazatlan, one hundred and twelve at La Paz, Lower California, two hundred and forty at Guaymas, and over three hundred in Hermosillo. It killed in Mazatlan, La Paz, and here last year. In short, I am firmly of the opinion that the disease is now endemic, and my opinion is held by the leading physicians in Mazatlan. With the very rapid railroad communication now between Mexico and California, its introduction into the Sacramento Valley is very probable. Once there, it will make things "hum." You have the necessary heat, moisture, swamps, etc., and I am fully of your opinion as to the danger that you run. \* \* \* \* \*

There was no fumigation or disinfection practiced in Mazatlan during the yellow fever epidemic, and the whole place is full of the poison of yellow fever. With very kind regards, I remain, dear doctor,

Yours, respectfully,

WOLFRED NELSON.

[Signed:]

To G. G. TYRRELL, M.D., Secretary California State Board of Health.

Several letters were subsequently received from Doctor Nelson, advising the Board of the progress of yellow fever and other epidemic diseases which threatened this coast. This Board having no funds at its disposal for the purpose of placing a quarantine on the frontier, we were practically helpless. However, in September, 1885, the United States Government, recognizing the threatened danger, appointed Dr. T. King Ross as quarantine officer at Nogales, a position which he had most efficiently filled during the preceding year. At this time the yellow fever was epidemic in Sonora, Mexico, and as Nogales was the favorite resort for those fleeing from the pestilence, a quarantine officer was absolutely necessary to protect us as far as possible from the invasion of the disease into California. Anxious to get all the information that might aid us in our endeavor to save the State, under instructions from the Board, your Secretary, in October, 1885, wrote a letter to Dr. B. R. Carman, an experienced and accomplished physician at Mazatlan, asking his views upon yellow fever and its progress. The doctor had removed to Rosario, a mining town in the State of Sinaloa, and some distance from Mazatlan, and therefore did not receive the letter until some weeks had elapsed. However, on November 8, 1885, he replied in a very interesting letter, parts of which, bearing upon the subject, are here quoted. He says, speaking of yellow fever:



The persons mostly attacked are those who have recently come into this zone, either from abroad or from neighboring States. In Acoponeta, a town some seventy miles to the south from here, on the road to Tepic, in the State of Jalisco, and at Santiago, further south, during September and October the epidemic was very severe. From these places it was brought to these mineral districts, and to others on higher altitudes, some three thousand feet above the sea level. Here in Rosario, a mining town of some seven thousand inhabitants, and in the surrounding villages of Chamelta, Las Vegas, Cacalotan, Esquinapa, etc., containing as many more, the number of cases this season have been small, and perhaps not so malignant as those of the years 1883 and 1884.

In Presidio, or La Union, half way to Mazatlan, there has been a number of cases, but they were chiefly among the soldiers, who came from the States. In Mazatlan the same has happened, with the exception of a few strangers who arrived there from abroad at the so called hotels of that place. Neither is it to be wondered at that these are readily infected. These hotels have been nests of disease since the fever started. Their cesspools and their privies are in the most horrible condition imaginable, and remain so. The rooms and beds are few, and are used over and over again with each new victim. Such a thing as cleaning, disinfecting, or burning any clothing or bedding would be to the landlords preposterous. As to sanitary methods or Commissioners, it is ridiculous! Yes; in Mazatlan a Board of Health exists, composed of the Prefect or Chief of Police, a native doctor, and some others; but the less said about it the better, for they do absolutely nothing that their wisdom should induce them to do for the sake of the public health; and if they should recommend some useful measure it would not be adopted, for want of funds, as this fact is always given as an excuse.

In my career as a practicing physician in Mazatlan for many years I have often recommended sanitary improvements to avert threatened epidemics, such as to prevent the throwing of all the filth and human excreta from hospitals, prisons, and dwellings, and the deposition of dead animals along the beach in front of the city looking west, from whence all the fresh winds come to us; but I have only been snubbed by the authorities and ridiculed by the people that I should care to interest myself in such matters. It is the same, or even worse, in the smaller towns, as for instance: A few days ago I was called to see a woman who had recently come to town from the interior, and who had been ill two or three days with fever. As I entered the shabby little mud house, which was without windows, and as it was raining and the sky cloudy, the room was very dark, I asked for a light, and saw that the woman was very ill, having a temperature of 106°. As she moved for me to examine her she vomited a quantity of unmistakably black matter; to satisfy myself whether there was any undecomposed blood present, I had the vessel taken to the light at the back door of the room, and having satisfied myself, the woman who held the vessel deliberately threw the contents into the yard from where she stood. No sooner had the vomited matter touched the ground than hogs and chickens rushed at and devoured it. Such scenes are constant here, there being no closets in the towns, except among a few wealthy families and foreigners.

This terrible scourge had never been known to the present generation in this part of Mexico until recently, and if proper sanitary measures had been adopted to stamp it out, as has been done elsewhere, undoubtedly we would be free from it to-day. I fear that now its germs are so thoroughly disseminated in so fertile a soil as it finds among so much ignorance and filth, that it will become one of the institutions of the country, and help to retard all progress and civilizing influences on this western coast. It is impossible to judge of the actual extent of the epidemic, or of its mortality, with the condition of things that now exist. The relapsing fever, which was prevalent, was considered as a mild form of yellow fever, and as a relapsing fever is seldom fatal, all recoveries were accounted as recoveries from yellow fever. The fact was, that all cases of yellow fever that had advanced to the stage of vomiting black matter, or had hemorrhage, proved fatal with but few exceptions. True, the disease had never before occurred here, and all were ignorant of its etiology, clinical history, or its more advanced treatment. The consequences have been severe upon its victims. \* \* \* \* \*

I remain, dear doctor, yours truly, etc.,

B. R. CARMAN, M.D.

ROSARIO, November 8, 1885.

We thus have learned from the above and other correspondents, whose probity is unquestioned, that the frightfully fatal disease known as yellow fever has positively located itself close to our borders, and hereafter will be a constant menace to our safety. Fortunately for us this last year, the advent of Winter seemed to arrest the disease, otherwise we might have had reason to deplore the parsimony of the Legislature that refused a contingent appropriation to guard our frontier from the invasion of this most dreaded of all the infectious diseases. And we now take this opportunity of warning our legislators, that if, through their apathy, neglect, or parsimony, yellow fever once obtains an entrance into our warm valleys, where all the adjuncts are present to insure its development and diffusion, the



injury it would do our State is beyond computation, not only in the sacrifice of valuable lives, but in the deterioration of property values, as no one would care to live or own property in a region cursed by yellow fever. As in Mexico, so would it be here; there for years, in certain parts, the disease was unknown, but being once introduced it has taken up its abode permanently to the lasting injury of the country, and the almost total destruction of its valuable foreign trade.

#### SMALLPOX.

This disease being so extensively prevalent in Canada, in accordance with instructions received from this Board, I placed myself in communication with Secretaries of other State Boards in the East, in order that I might obtain such information upon the progress of smallpox that the Board might have an opportunity of at least warning the people of this coast of its approach, and advising such precautionary measures as might seem best to retard its advance. From the information thus obtained, the deduction was drawn that our danger from smallpox was much greater by way of China, Japan, and Mexico, than by that of the Eastern States, as we found that the States bordering the Canadian frontier were strictly guarded by able and efficient quarantine officers, and all travelers coming from the infected districts were subjected to a rigid inspection, and if necessary, vaccinated before being allowed to proceed into the United States. Our intercourse with Mexico being by rail as well as by sea, the liability of the conveyance of smallpox by immigrants is very great. In fact, the only cases we had in this State in 1885 were two cases imported into Los Angeles County from Mexico. However, the local Board of Health being ever on the alert, detected, and by strict quarantine and other sanitary measures, confined it to the persons attacked, and prevented its further spread. In July, 1885, a letter was received from Dr. Wolfred Nelson, who was then in the Gulf of California, reporting the appearance of smallpox there; the number of cases was not known. The vessel upon which the disease appeared was quarantined, and no extension of it took place. In Japan the disease was quite prevalent during the year, and as it prevailed in the seaports of the Empire as well as the interior, the probabilities of our being infected through some way passenger was very great, and required the constant vigilance of Dr. McAllister, the efficient Quarantine Officer in San Francisco, to prevent its importation. In the early part of the present year, 1886, a case was discovered on the steamer *Belgie*, plying between China, Japan, and San Francisco. It was, as soon as discovered, quarantined by the ship's surgeon, and all the unvaccinated passengers at once vaccinated, which may account for the immunity from infection which the passengers on the voyage experienced, as there is no fact in the whole range of preventive medicine so clearly demonstrable than that the natural susceptibility to smallpox in the individual can be completely destroyed by vaccination, so that one so protected can fearlessly pursue his usual vocation with impunity amid the presence of this most contagious disease. And yet, with this fact so clearly demonstrated all over the civilized world, we find a class of persons in an old city like Montreal so blind to their own interests, and to the commercial interests of the Province, as to resist with riot and bloodshed the attempt to confer upon them this wonderful immunity from one of the most loathsome plagues known. Not only was the philanthropic efforts of humanitarians scorned, but bitter denunciations were heaped upon, and even personal violence offered to the physicians who attempted to explain the benefits of vaccination, or enforce its

adoption. Even in this State there are not wanting persons, who ignorantly consider that it is a breach of the liberty of the citizen to compel him to be protected by vaccination, or have the same blessing conferred upon his family. Hence the difficulty the State Board of Health finds in its endeavor to procure a law which would be general in its application to all unvaccinated persons; and until ignorance is banished by education, and superstitious fear by enlightened thought, I expect the same opposition will be experienced in every endeavor to benefit humanity in general by a proceeding that is susceptible of misrepresentation by prejudice, credulity, or the delusive fears of the illiterate. It is, however, to be hoped that a law making vaccination compulsory on all children attending the public schools in this State will be enacted without a dissentient voice by the incoming Legislature. This in itself would save hundreds, nay, thousands of lives, should we be so unfortunate as to have an epidemic of smallpox develop among us. It would not, however, save those children under school age who had not been rendered insusceptible to the disease by vaccination, or those exposed to it, who, by reason of inefficient, degenerated, or unperformed vaccination, were liable to be attacked. We do not believe the masses of the community are sufficiently well informed to understand the necessity of a law making a general vaccination compulsory, although we do believe that the State Board of Health should have legal power to enforce a general vaccination if deemed necessary to protect the people from smallpox. In England vaccination is compulsory; so it is in Scotland, Ireland, Germany, Sweden, and Belgium. In France it is not compulsory, except in governmental and some private schools. As Simon says, the main object of an obligatory law is not to prevent adults from cultivating a personal taste for smallpox, but to prevent them compelling their children to incur the worst perils of that disease. Or, as Dr. J. M. Toner, of Washington, D. C., puts it: "Parents and guardians have no more right to withhold or neglect to provide vaccination for their children under their protection, than they have to jeopardize the lives of these helpless infants by not furnishing them with food and clothing. It is criminal to neglect either, as death may be the consequence; but the failure to provide protection against smallpox seems to be more maliciously wicked than to neglect either food or clothing, as the former may not only cause the death of the child, but be the means of spreading disease and death among many others, while the evil which arises from the latter ceases with the death of the victim."\*

We, however, are convinced that there is a steadily advancing knowledge of sanitation taking place among the people of this favored State, and that public sentiment is gradually but surely coming to the support of all measures tending to improve and render more secure the public health. We believe this to be especially true in regard to preventive measures. The cosmopolitan character of the Californians making them earnest adherents to the doctrine of self protection in regard to life and liberty, they are now beginning to include in that doctrine of protection, the right to health, and that no man ought to have the power, for some puerile reason of his own, to imperil the safety of his neighbor; neither should the ignorance of the individual, of all sanitary appliances and all sanitary laws, debar him from receiving the benefit of those laws which may be devised for his welfare through the instrumentality or enlightenment of others. "The lives and health of its citizens," says Dr. H. B. Baker, in his report to the State Board of Health of Michigan, "is the most valuable property possessed by any

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\*Compulsory Vaccination, by J. M. Toner, M.D., Washington, D. C.

government, and whatever in any manner affects these, influences in the highest degree national prosperity."

Our commercial relations with Mexico, both overland and by sea, our constant communication with Australia, China, Japan, the Sandwich and other islands of the Pacific, expose us constantly to the invasion of epidemic and contagious diseases, among which the most frequent is smallpox, and the slightest relaxation of vigilance upon the part of our quarantine officers in San Francisco, rendered so unceasing by the inadequate means supplied in the provision of a proper quarantine station in the bay, might at any moment precipitate the catastrophe which sooner or later is sure to overtake us. It is the part of prudence to anticipate the worst, and by enacting a law making compulsory the efficient vaccination of all children attending public schools, or, better still, all children, we would be placing the most efficient safeguard known around our hearths and homes, and protecting our dearly loved ones from one of the most fatal and most loathsome diseases that ever afflicted humanity.

#### DIPHTHERIA.

From reports received throughout the State during the last eighteen months, the prevalence of this disease calls for more than a passing notice. Unlike smallpox or cholera, there are times when the appearance of diphtheria in a place cannot be definitely traced to the source from which it came, and although these outbreaks of "*spontaneous* diphtheria" must be classed with other forms of abiogenetic origin, and therefore comprehensible only to those who have faith enough to believe in that doctrine; nevertheless, the acceptance of this belief provisionally would give us at least an explanation of some otherwise unexplicable cases that have arisen from time to time. For ourselves, we do not believe that the disease can arise without infection or contagion from a previous case, and although the germs may elude our discovery, or may have been hidden for months, or even years, beneath accumulated filth, they are present whenever diphtheria appears. Its presence, however, in the absence of a known cause, may indicate, and most likely does, the neglect of hygienic rules and a breach of sanitary law, and the spread of the disease in any city, town, or village either shows the profound ignorance of the people of its contagious character, or a criminal disregard of the lives of others, by those in whose power it is to enforce an observance of those laws of health which govern epidemic disease. The casual relation between dirt and diphtheria has been abundantly shown by many competent observers. What the exact relation is, is one not yet decided, whether the unhygienic conditions of the surroundings, by impairing the resisting power of the individual, may render him more susceptible to the action of the poisonous germ when unexpectedly presented, or that the accumulated filth offers a field for the growth and perfection of the disease germs when once planted therein, either directly from a former sufferer with the disease, or indirectly from the germ being borne on the wings of the wind from some distant quarter where the disease prevailed, is still unknown. We do know, however, that in the presence of perfect cleanliness, and other requirements of sanitary law, the disease cannot exist; or, if existing, can be by care and vigilance completely extirpated, or banished, at least, from the community. The most difficult cases to guard against are those of a mild form, that do not indicate the presence of diphtheria, but only that of an ordinary sore throat. From these simple cases the most malignant epidemic may arise; as, from their apparent simplicity, no precaution whatever is taken to prevent those

afflicted from mingling with the public. Parents cannot be too careful in examining the throats of their children complaining of soreness in that region, and if they are expert enough to detect any white spots upon them they should lose no time in consulting their family physician, and until his opinion is expressed to the contrary, treat them as if they had diphtheria, by keeping them in the house and confining them to a room apart from others of the family. By this means the disease may be restricted to the family in which it has arisen, and prevented from diffusing itself through the community.

In Lincoln, October, 1884, the weather being quite dry, but the nights frosty, the frequency of what was apparently a common sore throat, excited the attention of the residents of that town. Those complaining of it were not confined to bed or the house, and mingled freely with their neighbors. Soon after the weather changed to rain, and after a few days of such weather, instead of the common sore throat, unmistakable diphtheria appeared and speedily caused the death of several children. Isolation was now enjoined, and the infected strictly quarantined. One family left the town to escape the disease, but carried it with them to Sacramento, where the child was treated and recovered. In Jolon, Monterey County, Dr. Moss McGowan writes that in San Miguel the disease appeared in January, 1885, with great virulence, causing several deaths. The doctor describes briefly the surroundings of these cases:

No. 1—Four cases. One fatal, in an old adobe building with small rooms, low ceilings, and little sunlight; well supplying house, shallow, upon low ground, probably contaminated with surface drainage.

No. 2—One case. In adobe similar to No. 1; had more sunlight and better ventilation; situated on river bottom; well deep.

No. 3—Three cases. Very severe; adobe building on river bottom; well probably contaminated by house drainage.

No. 5—One case. Building, frame; surroundings good.

No. 6—Four cases. Two fatal; building, frame and new; situated up in mountain; well in stable yard; habits untidy.

Many other cases in neighborhood have not come under my observation.

Upon receiving this report I at once advised the doctor to use all the means at her command to have the cases isolated and the locality disinfected, forwarding to her at the same time a supply of circulars issued by the Board upon the subject of diphtheria. Dr. J. N. Moss McGowan, who is a remarkably intelligent physician, and fully alive to the value of sanitation, distributed the circulars, and took all the means possible of warning the people of the danger they ran of contagion if proper measures were not adopted to isolate the diseased ones. For a time the disease was checked, but in September a request was made for more circulars, as the disease had again broken out with increased virulence in the same locality where it was prevalent in January. The doctor thinks it directly traceable to contagion from lack of efficient disinfection. Dr. McGowan, also, desired to know if there was any legal means by which such cases could be officially quarantined where no local Board of Health existed, and no Health Officer. To which query I was obliged to reply that there was no law by which infectious disease could be officially quarantined by the State Board of Health, and advised the doctor to state the case to the Board of Supervisors of her county, and request the appointment of a Health Officer, who, if so appointed, would be clothed with all the powers of a local Board of Health. At the same time with the circulars I forwarded the doctor a copy of the health laws of California. In the same month, September, information was received by this Board that diphtheria had become epidemic in Merced, and the schools were closed. I immediately wrote to our cor-

respondent there, Dr. H. N. Rucker, asking the truth of the story, to which he replied as follows:

DEAR DOCTOR: Yours of twenty-eighth just received. Yes, the Trustees were foolish enough to close the schools, and create a great sensation, simply on a rumor. The facts are as follows, and you can judge for yourself: The cases we have had here in town have all died. Of these I have already reported four—two each for the last two months. Two, as reported, were brought here in a hopeless condition last month. I reported two cases that occurred here in town. One was the case of a child, in the hotel where the first two from Mariposa County died; the other was not exposed to the disease, that we know of. There was one death in three cases (all in same family), on the Merced River, last month, and one death a few days since in the same locality. But these I did not report, as my report is confined to this town. We have had a death from the disease a few days ago, and one other child in the same family is now recovering from an attack. These are all the cases that have occurred in the county, that I have heard of. Only two of all the number were of a violent character. The case that created the great sensation was one of ulcerative pharyngitis. There seems to be quite a tendency just now to ulcerative pharyngitis; and we may have an epidemic of diphtheria, but I see no other indication of it now, and do not expect it.

Yours, very truly,

H. N. RUCKER.

Under the vigilant care of Dr. Rucker, I was satisfied the disease would be properly looked after, and such sanitary measures instituted as would best tend to eliminate it speedily if it took an epidemic form. In October the disease appeared in Modesto, and was reported by our valued correspondent C. W. Evans, M.D. He writes that "three cases occurred since October 1, 1885, all in one house, the inmates of which are subjected to the worst possible hygienic conditions, as regards clothing, food, care, and filthy surroundings. No other authentic cases are reported, although throat troubles are prevalent."

In December of same year Dr. Evans reported five cases. Again he writes: "It will be noticed that the death rate from membranous croup is very large. Of the five reported, four undoubtedly had membranous croup; the other case, though doubtful, was much like croup, in the history I was able to get; and though not characteristic, from hearsay evidence was diagnosed as such, and so I report it (not having seen the case myself). The cases of membranous croup all occurred in families where there had been no diphtheria before or since, except one, and only in one instance did two occur in the same family, both of which proved fatal, one occurring two weeks after the other."

In November it was reported to your Secretary that diphtheria was epidemic in Lemoore, Tulare County. I at once wrote to Dr. L. M. Lovelace, our correspondent in that county, to know the truth or falsity of the report. On December 1, 1885, the doctor replied:

DEAR DOCTOR: Yours of twenty-fifth just received. In answer to your questions as to diphtheria being here in an epidemic form, I am glad to say the report is not quite true. We have quite a number of cases, more of an endemic form. It seems to be a kind of diphtheritic croup. All that had it in that form died, and about eighty per cent of all who had diphtheria, that did not implicate the trachea, got well. There have been a number of cases of putrid sore throat, with deep ulcers of the tonsils, that readily yielded to the ordinary treatment; in some of these, membranous or diphtheritic croup, and was fatal in all the cases. \* \* \*

Yours respectfully,

L. M. LOVELACE.

In the same month diphtheria prevailed at San Diego. I at once entered into a correspondence with our correspondent there, Dr. Thos. L. Magee, who replied as follows:

DEAR DOCTOR: Yours of thirtieth instant just received: also, cholera circulars, for which accept thanks. Relative to diphtheria in San Diego: First, there is no sewerage in the city; second, the lots are but one hundred feet deep, without intervening alleys, so

that water closets are all in close proximity to houses. About the fifteenth ultimo we had quite a rainfall, followed by clear, warm weather. In less than ten days after that there were four deaths reported among children, which were diagnosed, respectively, as diphtheria, one as "hives in the throat," and one as tonsillitis. Latterly there have been no deaths, but there still prevails to some extent among children a livid inflammatory condition of pharynx, with enlargement of the glands, and to my mind clearly diphtheritic in character. \* \* \* \* \*

Respectfully yours,

THOS. L. MAGEE, M.D.

In March, 1885, Dr. Carl Walliser, then our correspondent in Santa Cruz, reported that diphtheria was very prevalent and fatal in the Santa Cruz Mountains, but owing either to the ignorance or poverty of the families in which it occurred, no physician was called in to treat them. Dr. Walliser very properly called the attention of the Board of Trustees to the presence of the disease, and asked that a local Board of Health be organized, or a Health Officer appointed. No attention was paid to his suggestions and no action taken.

From these extracts it will be seen that the correspondents of the Board are alive to the importance of sanitary measures in their districts, but unaided as they are by local authority, their power for good is simply individual and without compulsory power. Diphtheria has been almost epidemic in San Francisco, and although they have a Health Officer in Dr. J. L. Meares of wonderful executive ability, owing to the absence of penalty for neglect of notification of the Health Officer by the attending physician, cases of infectious disease, like diphtheria, are allowed to spread their poison without let or hindrance. The same lack of penalty enables householders to neglect the law upon this subject with impunity; under these circumstances it shows the vigilance and care exercised by Dr. Meares in keeping the disease at all within bounds. Wherever diphtheria has appeared and spread, it is not owing, as a rule, to the want of sanitary knowledge upon the part of the physicians in charge, but to the deficiency of legal means to enforce the sanitary measures desired by the physicians. It is impossible to compel people to obey ordinances or laws where no punishment is awarded for neglect or disobedience, and until the law is so amended as to carry punishment with its breach, the endeavor to compel people to be healthy will be futile. Diphtheria has been a visitant in all parts of the State, not only as far south as San Diego, but away north in Siskiyou, not in an epidemic form, but endemic cases have been noted, from time to time, throughout the year. As population increases, and buildings and dwellings get closer and closer, and sanitary arrangements continue to be neglected, the disease and its fatality will also continue to increase, unless the Legislature come to our aid by giving the State Board of Health sufficient legislative power to compel the organization of local Boards of Health or Health Officers in every city, town, and village in the State where such has been neglected or refused by the regularly constituted authorities.

#### SCARLET FEVER.

The mortality from this infectious fever has been limited, considering the extent of country over which the disease has prevailed. The type being mild, no precautions seem to have been taken to prevent its spread, consequently its germs being very tenacious of life, it need not surprise us to see an outbreak of the disease at any time that conditions favor it, which may assume a virulent type, the mildness of type at one season being no guarantee of its continuance as such. There was an epidemic of scarlet fever in Modoc County which caused several deaths. It prevailed

quite extensively in Tehama County, in Butte County, also in Shasta County and Los Angeles, but in none of them was the general type virulent. In May of this year I visited Truckee, at the request of the Superintendent of Schools, to investigate the nature of a disease which had caused and was causing considerable uneasiness to the inhabitants, who had induced the Superintendent to close the public schools. It was reported by one physician to be rothlen and spinal meningitis; the other physician as emphatically declared the town free of measles or spinal meningitis, but was afflicted with scarlet fever. After a thorough inspection and conversation with all the families in whose houses the disease had been, I obtained indubitable evidence that the disease was scarlet fever, and that it had been carefully propagated by permitting the sick to mingle with the well, by public funerals in the houses of the dead, and in the churches. Indeed, I found persons with the skin still desquamating freely mingling with the community without a thought of danger to themselves or others. I at once called the attention of the physicians to the nature of the disease, and the injury likely to arise from permitting those not yet well to visit the uninfected, and also to the sanitary condition of the town, which, after a careful inspection, I found to be in a most insanitary condition. A meeting of citizens was called, to whom I explained the nature of the disease, its very infectious nature, the probable indefinite duration of its stay among them if not thoroughly eradicated by disinfection, the absolute necessity of putting their town in a sanitary condition, the objects of which I explained, and the further necessity of having a Health Officer appointed. The advice tendered was at once acted upon, the Supervisors petitioned to appoint a Health Officer, and it was resolved to have all the houses in which scarlet fever had been or was fumigated and disinfected, and the whole town thoroughly cleansed and kept in a sanitary manner hereafter. This incident shows the necessity of a State Board of Health, and its auxiliary local Boards, to advise what is to be done in a case like the present. Here a whole community were alarmed, and some of them fled from their homes, not knowing how otherwise to save their little ones. Had this town a Board of Health or an efficient Health Officer much of this alarm might have been allayed by vigorously isolating and quarantining the sick, and taking such other precautionary measures as the circumstances might seem to require.

When we reflect upon the nature of scarlet fever and its sequela, and think of the many lives which, if not immediately sacrificed, are permanently disabled for the conflict which awaits them in the battle of life, that are in fact invalidated on the threshold of existence by one of the various ailments ingrafted into their system as a result of this disease, we cannot be too prompt or too earnest in our endeavors to prevent the invasion of the fever, or, if it has already appeared, to annihilate it as speedily as possible. Better one household should be put to temporary inconvenience than a whole community infected; better that a whole town be quarantined rather than have such a treacherous disease spread over a county, with death and untold misery following in its trail. In such an emergency as this, it is almost impossible to demonstrate the value of an efficient local Board of Health for its ability to instruct the people in the causes of the disease, to warn them of its serious results, and their power to prevent avoidable evils; to prevent nuisances, or abate them when they exist; to be ready to meet promptly any sudden peril from epidemics; and to bring to bear with alacrity the power of the law when other means fail. In matters appertaining to health, there is nothing so efficient as proper organization.



With it the removal or prevention of all communicable disease is possible, or if not, its power to lessen the ill effects of preventable disease is unquestionable.

#### MEASLES,

Have prevailed to some extent in many places throughout the State. In none of them did the disease assume a malignant form, or call for any extraordinary sanitary measures at the hands of your Secretary.

The question has been asked whether we are justified in requiring that the dwellings containing those sick with measles be quarantined and the patients isolated? The objections to it being these:

*First*—That measles, although infectious, is usually not a very fatal disease, the deaths, when produced, not being from the measles *per se*, but from complications engrafted upon the disease.

*Second*—That if fatal, it is much less so in childhood and youth than in adult life; and as it is an exanthem that protects for life, better to have it when young than when advanced in years.

*Third*—That owing to the early disengagement of the furfuraceous dust that emanates from the convalescent measly patient, and its easy dissemination through the atmosphere from its lightness, a quarantine would entail great hardship, and be utterly useless for the purpose instituted, as the diffusibility of the infecting medium could not be confined within the walls of a house, and that once outside, its power of infection must be unlimited.

These reasons, although very cogent, and containing a great deal of truth, should not permit us to relax the rule of preventing, where possible, the spread of communicable diseases. Measles are usually mild; but who can prognosticate when they will be mild, or when black and malignant? By relaxing our vigilance we may admit an enemy into our midst that will decimate the people like a plague.

Children should not be admitted into school until at least two weeks have elapsed since the disappearance of the rash. Their clothes should be thoroughly fumigated, and their dwelling place disinfected. Having done everything within our power to limit the spread of the disease, we will have the inward satisfaction of knowing that any subsequent sufferer will not have been endangered by any carelessness or neglect of a plain duty upon our part.

#### TYPHOID FEVER.

This insidious disease, which may truthfully be characterized as "the pestilence that walketh in darkness," has not exceeded its usual mortality throughout the State, judging by the reports received during my term of service. Unfortunately the statistics from which some deductions might be drawn of its relative frequency of mortality, in any particular part of the State more than in another, are so defective as to be useless for that purpose. This is the more to be regretted from the fact that in the last report of the State Board of Health of Michigan, an able article was written by the distinguished and efficient Secretary of that Board, Dr. Henry B. Baker, "Upon the Relation of the Depth of Water in Wells to the Causation of Typhoid Fever," which might have received some confirmation, or otherwise, in this State, if we had reliable data of the exact mortality which occurs from year to year. We are convinced, from many years' experience and observation, that typhoid fever is more prevalent in this State during the Autumn and early Winter months than in the Spring; and depending, as we believe it does, upon local conditions appearing in dwellings where no expectation of such a disease would naturally arise, and



again remaining absent from localities where it might be supposed it ought to prevail, we are naturally led to inquire into the reason of this prevalence of a supposed particulate disease at one season of the year more than another, and what relation the disease bears to the circumstances surrounding it. Dr. Baker believes that the prevalence of typhoid in the Autumn months depends, in a great measure, upon the condition of the wells, and the quantities of water contained therein control the rise and fall of fever. Although Dr. Baker is not fully convinced, but continues undecided, as to whether the contagium of typhoid is a specific organism or otherwise, "he *can* say that the cause is associated with decomposing organic matter of vegetable and animal origin in drinking water, and that it appears to be capable of reproduction, thereby making it extremely probable that the cause is organic, and probably one or more of the bacteria; many of such organisms are known to be able to reproduce themselves in meat juices and other fluids consisting of water and *animal* products: also in *vegetable* infusions, and even in *mineral* solutions not directly derived either from animals or vegetables, as, for instance, in Pasteur's solution. Yet it is probable that by proper effort we may soon learn the truth—whether typhoid fever is ever caused by more than one species of bacteria, whether the cause of every case is derived from a previous case."

A comparison of the meteorological and other conditions led Dr. Baker to conclude that no circumstances known to him varied in such a manner as to explain the unusual prevalence of typhoid fever in certain months, except the condition of the ground water, as indicated by its lowness in wells; and he explains this by supposing that when the ground is parched and dry the surface supplies of drinking water, wash water, etc., are diminished to such an extent that unusually large drafts are made on the wells. This increased use of well water would lead to the drainage of an unusually large territory around the wells, with a consequently increased danger of contamination from privies infected by typhoid excreta.

Max V. Pettinkoffer, who has given this subject much attention, is of the opinion that the increase or decrease of typhoid fever coincides with the rise or fall of the subsoil water, increasing as the water falls, and decreasing as it rises; and explains it by the assertion that with the recession of the water the air enters deeper layers of soil, and there stimulates into activity and multiplication disease germs, which were dormant so long as they were submerged in water. These germs permeate this ground air; and whenever the barometric pressure is low, or other conditions favor its upward movement, the germ laden air rises from the soil, and enters houses, and causes typhoid fever.

I believe, myself, presupposing the germs to be present, that both theories contain a vast amount of truth. In this State a perhaps quite similar condition of things exists at certain seasons. As the rivers fall, the marshes and ponds dry up, and the subsoil water on the highlands attains its lowest level, we find that malarial and enteric fever prevail; but this connection is not invariable or applicable every year or for all places. In San Francisco, for instance, as shown by Dr. A. Perry, typhoid fever prevails more intensely during the rainy season, when the streets are washed and the sewers flushed with water. In these cases, Pettinkoffer's ground air, rising from the pressure of water, may account for the prevalence of the fever; and in the interior, where wells are used, the surface drainage being diverted from its usual channels to the lower wells, may, through the contaminated water, be the exciting cause of the disease. It is, however, remarked

that in Sacramento, if typhoid fever prevails to any extent it is in the Autumn, when the water in the river is lowest, or after the first rain succeeded by dry and warm weather; and in the highlands and foothills it is much oftener observed after the first rains, when the wells receive the surface water. We are therefore led to look beyond either atmospheric or telluric influences for the cause of this fever, and seek it among the particulate poisons which are neither vaporous nor gaseous but endowed with life capable of reproduction, and therefore dependent for their existence upon certain local conditions which may be totally independent of the state of the water, but which are always insalubrious, and without which the particulate germ would cease to live.

Although it has been asserted by such very competent authorities as Murchison, Leibermeister, Hudson, and others, that typhoid fever "may be generated independently of a previous case, by fermentation of fecal and, perhaps, other forms of organic matter," on the other hand as competent observers as Budd, Parker, Von Geitl, etc., are of the opinion, which even later authorities seem to confirm, that neither filth, fecal matter, sewer gas, or unpleasant odors are, of themselves, capable of generating typhoid fever without the presence of the specific germ upon which the disease depends. Be this as it may, all are agreed that filth and excrementitious matter, without the free access of pure air, and sewer gas and noxious effluvia under the same conditions, may become potent secondary factors in disease, and by their presence develop and fructify a poison that otherwise could not exist. Dr. Geo. M. Kober, U. S. A., stationed at Fort Bidwell, a highly intelligent and observant physician, to whom this Board is indebted for his zeal as a sanitarian, writing from his post November 2, 1885, says:

That most of the cases of typhoid fever, as reported by me, occurred at or near a settlement known as "Davis Creek," in Goose Lake Valley, although three cases originated here in Surprise Valley and its southern portion. Some cases were also noticed in the vicinity of Cedarville. The increase of typhoid fever in both valleys, in view of the low stage of water in the lakes, of which there are a number, covering nearly three quarters of the area of both valleys, together with a protracted dry season, strikingly confirms Pettinkoffer's theory "that the increase of typhoid fever coincides with the fall of the sub-soil water, and with the recession of the water the air enters deeper layers, and these stimulate into activity and multiplication disease germs, which were dormant as long as they were submerged in water." In reference to the cases observed in this section, I must say that in addition to actual recession of the subsoil water, as shown by the lowness of wells, the surroundings invariably suggest soil pollution and other insanitary conditions. In eleven years' experience on the frontier, I have observed that generally the last thing which the "pioneer farmer" provides is a suitable privy. Sometimes a large family live on a farm for years without this convenience, the fecal matter is deposited somewhere, and by the children usually not far from the dwelling or well. In many instances, when the privy is finally provided, no attention is paid to the prevailing winds, proximity to wells, and disposal. Is it a wonder, then, that after a few years so many families suffer from the ravages of such "filth diseases" as diphtheria, typhoid fever, etc.? The freedom which the garrison of one hundred and fifty people has enjoyed from these diseases during say five years service, can only be explained by the following facts: Prevention of soil pollution by strict attention to cleanliness, proper care of privies, and absence of wells. The water used is conducted in pipes from a clear mountain stream, but even mountain streams may be polluted by beaver dams, cattle, and horses. In fact, I have frequently drank water from mountain streams during the late Summer and Autumn months which had a perceptible taste of cattle manure, and wondered whether Dr. Smart had possibly overlooked these sources of ammonia when he prepared his article on mountain fever, etc. (American Journal Medical Science, 1878). In regard to enteric fever at this post, it is true a few cases have occurred, but these happened in recent arrivals from other localities. Indeed, the evidence seems to point to the fact that a soldier may imbibe the germs of typhoid fever at Jefferson Barracks, Missouri, may travel thousands of miles and arrive here after an interval of twenty days, either ill or in a condition to develop the disease within a few days. \* \* \* The frightful mortality from typhoid fever at Davis Creek was due chiefly to the intensity of the abdominal lesions, with perhaps some injudicious nursing or rather mistaken kindness of friends. You can imagine a room 12x15 filled with eighteen sympathizing friends willing to "sit up with the patient and keep each other company." The effect upon the patient can well be surmised, yet this is a custom of our good well meaning country

folks. In many other communications received from correspondents the general impression seemed to prevail that the poison of typhoid fever was more frequently conveyed by means of drinking water than any other way, and that those cases of so called spontaneous origin depended upon an anterior cause, which, while not discovered, was certainly discoverable, if the means were adapted to the end. In the Caterham epidemic, which occurred in England in 1879, three hundred and fifty-two cases and twenty-one deaths occurred from the pollution of the water supply of two towns by excrement of a single workman. In Lausanne, in Switzerland, the typhoid poison was conveyed by water nearly a mile through porous earth, and was traced to a single family on the other side of the mountain ridge, whose dwelling was situated close to a brook, into which the dejections of the patient were thrown. This brook was used to irrigate some meadows near the farmhouse, and the effluent water filtered through the intervening mountain to a spring used in the houses of Lausanne, except six that were supplied with water from private wells. In these six houses no case of fever occurred, while in the others scarcely one escaped. The passage of water from the irrigated meadows to the spring at Lausanne was proved by dissolving in it at the meadows 18 cwt. of common salt, and then observing the rapid increase of chlorine in the spring water. But the most important and interesting experiment consisted in mixing uniformly with the water 50 cwt. of flour, not a trace of which made its way to the spring, thus showing that the water was *filtered* through the intervening earth and did not pass by an underground channel. It affords a clear warning of the risk attending the use, for dietetic purposes, of water to which even so called purified sewage gains access; notwithstanding that as at Lausanne such water may have been used with impunity for years, until the moment when the sewage became infected with typhoid poison. ("Public Health," April 14, 1876.)

This extract shows conclusively the fallacy that water purifies itself within any reasonable distance from the source of infection, and the obvious conclusion to be reached is that any water exposed to the contamination of sewage or other forms of filth should be regarded with the gravest suspicion, as neither chemical analysis or microscopic examination has been able to detect the subtle poison to which the fever is attributable. Water which is unobjectionable to the senses of sight, taste, and smell, may nevertheless contain the morbid agents capable of propagating this and other forms of disease. It is therefore of the greatest importance to the health of a community that the strictest scrutiny should be exercised with respect to the supply of water. Every case of typhoid fever should be, if possible, traced to its source, as one of the commonest factors in the etiology of the disease may be found in the water consumed.

#### TRICHINIASIS.

In March, 1886, Dr. W. D. Groton reported that four cases of trichiniasis had come to his notice during his practice that month. This acute febrile disease having hitherto escaped observation in California, at least as far as known to the writer, or can be ascertained through inquiry among his professional brethren who have long resided in the State, I at once wrote to Dr. Groton, believing the matter to be one of unusual importance to the welfare of the State and its people, and asked him to furnish me with a report of the cases, and likewise a sample of the meat to the ingestion of which the disease might be attributable. The doctor very kindly and promptly responded in the following letter:

SUSANVILLE, LASSEN COUNTY, April 13, 1886.

DEAR DOCTOR: I will give you all the data I can gather on the subject. I would like to be able to write more explicitly, but the ignorant prejudice of the family has proved an almost insurmountable barrier to all investigation. I was requested by one of our druggists, on the eleventh of February last, to call upon Mr. S., an Italian living in the foothills, about seven miles from Susanville. He had been sending medicine to them for over a week, and now they wished him to go out, but for prudential reasons he turned them over to me. I found Mr. S.'s brother and a hired man both in bed with the following symptoms: Face œdematous, eyes swollen and shut, hands, feet, and ankles also swollen and tender to the touch, pulse one hundred, temperature one hundred and one, tongue heavily coated. There was anorexia, thirst, severe diarrhœa, and in one case difficult micturition. Mr. S. and his wife had suffered similarly the previous week, but had taken, she said, "physic,"

and although not well was able to be about. I had never seen a case of trichinosis, but the symptoms were very suggestive, and when I found that they had all been eating Italian style of raw sausage, I hazarded the diagnosis, and asked for some of the delicacy to bring home with me to examine, leaving such remedies as seemed indicated. Upon reaching my office I proceeded to examine the sausage, but not having much experience in microscopy, and my instrument not being well adapted to the work, I did not succeed in demonstrating the presence of trichina to my satisfaction; so I sent some specimens to Prof. Lane, with a request that he would have them examined. In the meantime, Mr. S., offended, I presume, by the aspersions cast upon his pork, called another doctor, who at once pronounced the disease typhoid fever, and I was made the occasion of considerable pleasantry by some of the wisecracks of the vicinity. I soon received letters from Dr. Lane and Dr. A. Abrams, confirming my diagnosis, and then I sent you some specimens, and the result of your investigations tallied with the reports of Drs. Lane and Abrams. Still Mr. S. violently repudiated the combined testimony, and the family, consisting of six persons, shut themselves up and refused to give any reliable statement to any one. This much is, however, I think substantially correct, viz.: that his hogs had been killed some days apart and the meat made up, with a large proportion of beef, into two separate lots of sausage. A few days after the second lot had been made, the symptoms above enumerated appeared, and soon the whole family were sick except two children, and these they claim had not been sick, although they likewise had partaken of the sausage all the time, but this part I take *cum grano salis*. There has been temporary improvement or sudden relapses with them all; but so far no deaths. The two males and one sister have recently been taken to Carson to consult a Chinese doctor! So probably there will be a chance for an autopsy yet. The two hogs killed were natives raised in the neighborhood. One of them only was diseased. In my opinion the cases are altogether sporadic, and if the thoroughly cooking of pork be a sure prophylactic, I do not believe that we will have any more cases in this county. \* \* \*

Yours very truly,

WM. D. GROTON, Susanville.

Upon examination of the sausage sent me by Dr. Groton under the microscope, I discovered numerous trichina in each slide examined. Some of them were capsuled, and some free. It was therefore deemed prudent to advise that all the sausage made by these Italians be destroyed by fire, and any hogs showing symptoms of fever be killed and their carcasses burned. Soon after the recognition of these cases, information was received that Dr. W. S. Taylor, of Livermore, had discovered a case of trichiniasis in his district. At once communicating with him, I learned that the subject was a German aged nineteen, an employé in a meat shop; ill four weeks. The first day the doctor saw him he complained of slight sore throat and "soreness in his bones;" tongue was coated and bowels constipated. At the end of the first week said he felt good, but was tired; temperature 102, pulse 100, heart's action tumultuous, bowels still constipated, urine copious. Second week, temperature 103, pulse 108, sleepless, with marked prostration; nose bled two or three times. Third week, temperature 102, pulse 110; sleepless, complained frequently of being tired; urine scanty, no desire for nourishment; diarrhœa, with ochre-colored stools; tympanites very well marked; very slight tenderness over abdomen. Latter part of third week, there was marked swelling of feet and some soreness of muscles, but the latter was not very pronounced. Fourth week, temperature declined, pulse increased to 120; swelling of feet increased, which also showed itself in the hands; the œdema rapidly extended to legs and arms, and then to the body, when he complained very much of the soreness in lying, and also when moved; neither face or head became œdematous; urine passed to-day, 24 ounces; diarrhœa continued to the last; no vomiting at any time; very slight delirium during the last week. Although previously interrogated, did not admit that he had eaten raw pork until the day before death, when he stated that he had eaten some fresh pork and beef chopped together and seasoned with salt and pepper; this he had eaten raw about one week before illness began. The source of the diseased pork is unknown. The hogs for this shop are purchased from all parts of the valley, and kept together until needed for the market.

During the past Winter, Dr. Taylor says, "a great many hogs have died in the San Ramon Valley, fifteen miles from here, from a disease which is called quinsy; and by our local paper to-night I see there are some dying about here from hog cholera. I am not versed in diseases of the hog, but will carefully look into the matter."

The muscular fiber taken from this case swarmed with trichina, as shown under the microscope. This is the first case that has ended fatally in California, within the knowledge of your Secretary. It leaves no doubt of the advent of trichina to our coast; and as no means to cure the disease have as yet been successfully used, or, indeed, discovered, it becomes a very important question to decide, how to protect the citizen from the consequences likely to follow the consumption of diseased pork? The only correct method is that pursued upon the European continent, viz., the microscopical examination of the flesh of every hog killed for human use, accompanied by the examiners' certificate that it is sound and healthy. Diseased carcasses are at once condemned and destroyed. If this remedy, under our statutes, cannot be made available, a law should be passed to that effect, the protection of human life being one of the first duties of the citizen. In the meantime, and while the danger threatens the public, it should be widely known that thorough cooking is an efficient means of destroying the parasite; and under no circumstance should any one eat swine's flesh either underdone or raw.

#### LOCAL BOARDS OF HEALTH.

In the organization of the State Board of Health, among other duties assigned to it, is to place itself in communication with local Boards of Health throughout the State, and take cognizance of the interests of health among the citizens generally. In pursuance of this duty, and to make myself familiar with the names of cities and towns incorporated in the State, that should, according to Section 3061, Article 5, Chapter 2, of the Political Code, have established a local Board of Health, I addressed the following circular to every County Clerk in every county in the State:

*To the County Clerk of — County:*

DEAR SIR: Will you inform the State Board of Health of the names of the incorporated cities and towns in your county, and also in which of the towns or cities is an acting Board of Health?

Please answer, and return, and oblige,

Yours, respectfully,

G. G. TYRRELL,

Secretary California State Board of Health.

From the replies received I learned that the Counties of Lake, Trinity, Merced, Kern, Shasta, Modoc, Sierra, Ventura, Amador, Inyo, Placer, Alpine, Calaveras, Mono, and Sutter, had no incorporated cities, and no acting Boards of Health, with the exception of Merced and Modoc, that had organized Boards of Health, and Bakersfield, in Kern County, had appointed a Health Officer.

The incorporated cities and towns in the State are:

San Francisco,	Stockton,	Cloverdale,	St. Helena,
Oakland,	Yreka,	Wheatland,	Martinez,
Haywards,	Gilroy,	Riverside,	Williams,
Vallejo,	Grass Valley,	Woodland,	Watsonville,
Dixon,	Visalia,	Ukiah,	Petaluma,
San Rafael,	Sacramento,	Etna,	Healdsburg,
Chico,	Berkeley,	Redwood City,	Marysville,
Eureka,	Livermore,	San José,	Los Angeles,

Placerville,	Benicia,	Pasadena,	San Diego,
San Luis Obispo,	Salinas,	Modesto,	Mariposa,
Santa Rosa,	Napa,	Alameda,	Fort Jones,
Santa Barbara,	Antioch,	San Leandro,	Santa Clara,
San Bernardino,	Colusa,	Sonora,	Nevada City,
Anaheim,	Santa Cruz,	Suisun,	Santa Ana,
Red Bluff,	Sonoma,	Fresno,	Crescent City.

Of these, the following have organized Boards of Health:

San Francisco,	Santa Barbara,	Napa,	Red Bluff,
San Bernardino,	Sacramento,	Petaluma,	Fresno,
San Diego,	Riverside,	Stockton,	Chico,
Vallejo,	Marysville,	Woodland,	Santa Rosa.
Watsonville,	Berkeley,	Los Angeles,	

The following have a Health Officer:

Oakland,	Nevada City,	Truckee.
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From these figures we learn that out of sixty incorporated cities and towns that should, according to Section 3061 of the Political Code, have organized and put in operation local Boards of Health, nineteen only have complied with the law. Two incorporated cities have appointed a Health Officer in lieu of a Board of Health, and no less than fifteen counties have no incorporated cities or towns, and consequently no properly organized Boards of Health or Health Officers. It is to be regretted that at least the incorporated cities and towns have not more generally complied with the law, as local Boards are to the State Board what members are to the body—the loss of even one destroys the unity of the structure and leaves a defect in the general perfection of the whole which more or less impairs its usefulness.

The effort to arouse public sentiment to the necessity and priceless value of sanitation as a means of preserving the health and vitality of the community, devolves, in a great measure, upon local Boards of Health, working in their own particular districts. The law clothes them with ample and even arbitrary power to control and remove every danger which, by reason of insanitary surroundings, threatens life or health. It gives into their hands, we may say, the issue of life or death, health or sickness of the community, from preventable disease; we do not say all disease, but we do say all disease the germs of which are bred in decay, fostered in filth, and sent forth on their errand of destruction through uncleanness and dirt. The responsibility being so great, and the power of doing good so immense, it does seem strange that the inhabitants of the different incorporated cities and towns do not insist upon their right to protection from "the pestilence that walketh in darkness" and the destruction that is already at their doors, only awaiting a favorable opportunity to come forth and slay its victims. But to be useful they must be efficient. Of the Boards already organized many are so only in name; they do not meet once in a year, never report to this Board, and are indeed practically dead so far as usefulness is concerned. We need life infused into these dead Boards; we need cultivation of the public mind to appreciate the value of these local guardians of the public health. When an epidemic of smallpox or cholera breaks out, and when death is reaping the reward of public apathy, carelessness, or distrust, and fear has usurped the place of reason, then the public, in its alarm, cries out to the authorities for help to stay the destroyer; Boards of Health are organized, Health Officers are appointed, and these are expected to do in a few days what is impossible. Had the

same community insisted on their Trustees or Councillors complying with the law, in organizing a local Board of Health and appointing and paying an efficient Health Officer, this calamity might not have befallen them. If the law continues to be disobeyed, and cities and towns be left to the ravages of disease, the citizens themselves are alone to blame for it. They have the power to call their servants to account for permitting this wrong to exist, and they have the power to compel a compliance with the law in this serious matter.

Section 3061 of the Political Code of California, relating to Boards of Health, says:

It shall be the duty of the Board of Trustees, Council, or other corresponding Board, of every incorporated town and city of this State, to establish, by ordinance, a Board of Health for such town or city, to consist of five persons, one at least of whom shall be a practicing physician and a graduate of some reputable school of medicine, and one, if practicable, a civil engineer. The members of the Board shall hold their offices at the pleasure of the appointing power. Every local Board of Health established in this State must:

*First*—Supervise all matters pertaining to the sanitary condition of their town or city, and make such rules and regulations relative thereto as are necessary and proper, and not contrary to law.

*Second*—Report to the Secretary of the State Board of Health, at Sacramento, at such times as the State Board of Health may require:

a. The sanitary condition of their locality.  
b. The number of deaths, with the cause of each, as near as can be ascertained, within their jurisdiction, during the preceding month.

c. The presence of epidemic, or other dangerous, contagious, or infectious disease, and such other matters, within their knowledge or jurisdiction, as the State Board may require.

The Trustees, Council, or other legislative Board, by whatever name known, of any incorporated city or town of this State may, by ordinance, adopt any portion of Articles III and IV of this chapter, or either of them, for some definite period of time, as may seem proper for the regulation of sanitary matters within their town or city.

SEC. 2. This Act shall not extend to any incorporated city or town, or city and county, for which health regulations are provided by special statutes.

SEC. 3062. In the place of appointing a Board of Health, the Board of Supervisors, or the city or town authorities, may appoint a Health Officer, with all the duties and powers of the Board of Health and Health Officer, as specified in the two preceding articles.

SEC. 3063. All necessary expenses of enforcing this article are charges against the counties, cities, or towns, respectively, for the payment of which the county, city, or town may levy a per capita tax of not exceeding three dollars, or a property tax of not exceeding one fourth of one per cent yearly, until the same is paid.

Here you have the law explicitly stating that Trustees, Council, or other corresponding Board, *shall* establish by ordinance a Board of Health, or in lieu of that it may appoint a Health Officer; but either must be appointed, if the city or town authorities do their duty.

In the statement within made we find no less than forty-one incorporated cities or towns without either a local Board of Health, or a Health Officer; no one whose duty it is to ascertain the sanitary condition of the town; to take cognizance of the fact whether it is clean or dirty; whether the air breathed by the inhabitants is poisoned by noxious exhalations, or pure and healthy; whether the water they drink is wholesome or productive of disease; all is left to blind chance, and when epidemic disease strikes such towns, or selects such cities for its particular manifestations, the inhabitants thereof wonder how a merciful God can so afflict them, or in so dreadful a manner visit them for their sins. It is lamentably true that in such calamity, the iniquities of the constituted authorities are generally laid at the door of the Almighty. He is blamed when the blame belongs to the people themselves, who will not see the danger that daily threatens their health, until the enemy storms the citadel and slays its hundreds. What is the remedy to correct this apathy and carelessness on the part of the public? The only feasible one that presents itself just now, to compel compliance with the law, is to grant increased authority to the State Board



of Health, make it responsible for the organization of local Boards of Health in every city, town, and village in the State; or if this is too autocratic, give it the power that whenever a city, town, or village neglects or refuses to appoint a local Board of Health or a Health Officer, upon due notice being given to so appoint, in such event it shall be privileged itself to appoint such local Board or such Health Officer, as it may deem best under the circumstances. Under such power conveyed to the State Board, you would find within six months that every incorporated city, town, or village in the State would have its local Board or Health Officer. We would proceed further; we would compel such local Boards to hold monthly meetings, and to send a transcript of their proceedings to the State Board under a severe penalty for neglect. This would insure coöperation all over the State, and enable the State Board to take such precautionary measures in case of epidemics as it might deem prudent to avert any threatened danger to health or life.

Unincorporated cities or towns should not be left unprotected. According to the present law the Boards of Supervisors *may, in time of epidemics*, appoint for a definite period a Board of Health or a Health Officer; but why an unincorporated city or town is obliged to wait until decimated by epidemic disease before a Board of Health is organized, is one of the conundrums of law that no layman can find out. This Board of Health, or Health Officer, is limited to time, and it is left wholly discretionary with the Board of Supervisors whether they appoint or not. Surely, the citizens of a great empire State like California are alike entitled to protection for their health and lives, whether they live in a city unincorporated or otherwise. If it is discretionary for a Board of Supervisors to allow an epidemic to devastate a town, or if *they* are to decide when or how long a Health Board is needed, then, indeed, equal protection is not vouchsafed to all. The law should be so amended as to make it compulsory on Boards of Supervisors to organize Boards of Health or Health Officers in every unincorporated town, city, or village in the State, irrespective of epidemics or anything else. And to this end efforts should be made to instruct the general public as to the history, the nature, and the means to be taken for the prevention of disease; and by as much knowledge of this kind as is rendered popular, so will the desire increase for the most perfect protection from pestilence that can be attained.

There is no doubt that for the efficient guardianship of the sanitary interest of the State, a Board of Health ought to be organized in every city, town, and village within its borders, and such Boards or Board should be perfectly independent of municipal control, as far as relates to the government of its own body or the election of its Health Officers. It should be composed of citizens of known worth and probity, and, if possible, of those who know and can appreciate the necessity of cleanliness of person and habitation, and the powerful prophylactic virtues of pure water and pure air. One, at least, of each Board ought to be a physician, as should also be the Health Officer, who should be elected for his promptness and energy, and an intelligent acquaintance with the duties to be performed. The Health Officer should be invested with ample power to compel the work done which he thinks necessary to insure the citizens of his community against the inroads of disease and death; it being neither equity or justice to permit one neighbor to suffer for the sanitary ignorance or wilful disobedience of another. The greatest difficulty to be encountered in the perfect and harmonious working of the Boards will be met in the parsimony of the appointing powers, in awarding a proper compensation to the Health Officer



for the duties he has to perform. The office is a most important one, and a competent officer cannot be expected to give his time and trouble for nothing, or next to nothing. It is ill-judged parsimony to cripple the executive officer of a Board of Health that has the care of the health of the community to look after, as half a dozen deaths from a preventable disease causes more pecuniary loss to the town in which it occurs than twice or three times the pay of an efficient officer who does his duty. When any city or town realizes fully the value of an active, intelligent, and efficient Health Officer, there will not be much trouble made in giving him adequate compensation, but until that point is reached, I fear parsimony and inefficiency will rule the actions of our law-givers.

#### STATISTICS AND REGISTRATION.

While we believe that we are inhabitants of a State exceeding all others in the salubrity of its air, in its diversity of climate, in its general adaptability to the wants of mankind, and its freedom from disease, yet, owing to our defective statistics, we have no means of proving our assertion or showing conclusively that we have less deaths, more marriages, and more babies than any other State in the Union. Our inability to do this is not so much to be attributed to defect in the law as it is from the lack of power to enforce the law. I desire to call your attention to the chapter in the Political Code relating to births, marriages, and deaths, as follows:

#### CHAPTER III.

##### *Registry of Births, Marriages, and Deaths.*

- SECTION 3074. Registry of marriages.  
 3075. Registry of births.  
 3076. Registry of deaths.  
 3077. Reports to Recorder.  
 3078. Same.  
 3079. Duties of Recorder.  
 3080. Report to Secretary of State Board of Health.  
 3081. Fees.  
 3082. Penalties.

3074. All persons who perform the marriage ceremony must keep a registry of the time of each marriage so celebrated, the residence, the names in full, the place of birth, the age of each party, and whether either party has ever been married.

3075. All physicians and professional midwives must keep a registry of the time of each birth at which they assist professionally, the sex, race, and color of the child, and the names and residence of the parents.

3076. Physicians who attend deceased persons in their last sickness, clergymen who officiate at a funeral, Coroners who hold inquests, sextons and undertakers who bury deceased persons, must each keep a registry of the name, age, residence, and time of death of such person.

3077. All persons registering marriages, births, or deaths, must quarterly file with the County Recorder a certified copy of their register. All such certificates must specify, as near as may be ascertained, the name in full, age, occupation, term of residence in the city or county, birthplace, condition, whether single or married, widow or widower, sex, race, color, last place of residence, and cause of death of all decedents.

3078. If at any birth no physician or midwife attends, the parents must make the report.

3079. The Recorder must keep separate registers, to be known as the "Register of Marriages," the "Register of Births," and the "Register of Deaths," in which the marriages, births, and deaths certified to him must be numbered in the order in which they are reported to him. There must be stated in each register, in separate columns, properly headed, the various facts contained in the certificates and the name and official or clerical position of the person making the report. The Recorder must carefully examine each report and register the same marriage, birth, or death but once, although it may be reported by different persons.

3080. The County Recorder must, every three months, transmit to the Secretary of the State Board of Health, at Sacramento City, a certified abstract of the registers of births, marriages, and deaths, prepared in the manner prescribed in the instructions of the Secretary, and upon blanks to be furnished by him for that purpose.

3081. County Recorders, in those counties where their compensation is by fees, shall be allowed by the Board of Supervisors a fee of not exceeding ten cents for each name reported, to be paid out of the General Fund of the county; and in those counties where their compensation is by a fixed salary, the duties in this chapter provided shall be performed without compensation other than such salary.

3082. Any person on whom a duty is imposed by this chapter, who fails, neglects, or refuses to perform the same as herein required, is liable to a penalty of fifty dollars, to be recovered by the District Attorney of the proper county, for the use of the General Fund of such county.

3083. The Secretary of the State Board of Health must prepare blank forms of said registers for the State Printer, who must print as many copies as the said Secretary shall direct, and deliver the same to the Secretary of State, who shall forward the same, from time to time, and in such numbers as shall be directed by the Secretary first mentioned to the County Recorders of the several counties, who must carefully keep and distribute the same to the persons in the county who are required to keep the registers and make the reports provided in this chapter.

In regard to registration of marriages they can always be obtained, as a license is necessary before the ceremony can be performed. In the case of births it is quite a different matter. The law says that physicians and professional midwives must keep a registry, etc. No penalty for disobeying this section being imposed, of course no one keeps a record or registry, except for their private use. The same neglect obtains in regard to the registry of deaths, and, as a result, no births or deaths are registered or filed with the Recorder.

Indeed, one Recorder to whom I wrote for a record of deaths, replied that for nine years no death had been registered in his books. Another replied that since he had been in office no deaths or births had been filed, and so, throughout the State, the law is practically a nullity, and for the reason that no penalty is attached, except by suit commenced by the District Attorney, and that at his discretion. We all know how loth a District Attorney is to commence suit against his neighbor upon a subject so trivial, in his estimation, as neglect to register his child's birth, or against a physician for neglect to register a death. In fact, no District Attorney will do it, as such particularity in having the law obeyed would insure his defeat at the next election. As a consequence, the law is practically a dead letter in our code, and no reliable statistics are available. Statistics upon any subject are valuable in proportion to their accuracy, it therefore becomes a matter of great consequence to provide such a method of collection of facts in all its details that it may be effective, complete, and reliable. As this can only be done by compelling those acquainted with the facts to record them, and as neither the Recorder or the District Attorney willingly wish to institute criminal proceedings against their townsmen, lest they incur the enmity of perhaps those who are their particular friends, or of their political party, or of some local influence, the law must be so amended as to make the neglect of registration of births, marriages, and deaths a misdemeanor, and punishable by fine or imprisonment, or both, and that the information for neglect be furnished by the Secretary of the State Board of Health upon his failure to receive the returns from the County Recorder. The law should be further amended so as to compel the County Recorder to furnish his abstract every month, instead of at present, every three months. By so doing a much more reliable return will be made, as neglect to register will be at once noticed and the proper remedy applied. In regard to the registration of births it would be only fair to compensate those registering by a small fee of twenty-five cents for each birth registered. This would insure the work done and prevent the plea so often offered, that the State had no right to ask its citizens to do its work without compensation.

The registration of deaths can be insured by the passage of a law requiring a permit to be provided before any human body is interred or cremated

within this State. This would compel the officer deputed to issue such permit to keep a record of his proceedings, and by making him, under a penalty, transmit his record monthly to the County Recorder, we would in a few years have statistics of immense value to the welfare of the State, as they would be as nearly correct as human ingenuity could devise. Of course the errors that would naturally arise would be those in regard to the nomenclature of the cause of death, and is inseparable from all records of mortality. We could, however, form a very fair estimate of the general causes of death, the influence of locality, employments, habits of living, etc., which would tend to fix the value of human life in California in regard to life insurance annuities, etc., and enable this Board to take more complete cognizance of "the interests of health and life among the citizens generally."

This Board is also required to make sanitary investigations and inquire respecting the cause of disease, especially epidemics. Now, it is a fact that no sanitary improvement worth the name will be effective, no matter what Act we pass or what power we confer upon officers, unless we can create an intelligent interest in the matter among the people at large. You cannot make a population cleanly or healthy without its coöperation or against its will. We must, therefore, have not only the power to enforce sanitary laws, but we must have intelligent Boards of Health to educate the masses to the necessity of healthy homes if they would have healthy lives; and here our greatest and our most important allies in sanitary reform will be the women of California. If we can only enlist them as executive officers under the banner of the Sanitarian, the progress of the work of educating the masses to the necessity of sanitation would be comparatively easy. To facilitate this work, we must again insist upon a law compelling the organization of Boards of Health in every town, city, and village in the State containing a population of five hundred inhabitants or over, to see and personally supervise the carrying out of the registration laws; to see that no one is buried or cremated without a permit, and to instruct the population under their charge in all matters appertaining to the sanitary care of their persons and homes.

These Boards should also be compelled to notify regularly the State Board of the prevailing sickness or presence of epidemic disease, wherever it occurs in any part of the State, to enable it to print and distribute such circulars or pamphlets among the people as would most likely call their attention to the means to be adopted to lessen the sickness or mitigate the virulence of an epidemic, if such should occur. Such reports and statistical investigations would enable us to measure with some precision what advances medicine was making in our State, what contagious or epidemic disease had been prevented or kept within narrow limits, what diseases had disappeared, and the frequency and fatality of others had been diminished.

To enumerate all the advantages that must result from improved health laws faithfully administered, would occupy more space than is possible to assign to them in this report. The arguments and illustrations which might be presented setting forth the value of systematic and thorough registration of vital statistics, would fill volumes. Suffice it to say, in the words of an eminent sanitarian, "registration teaches us every day that which every day should be brought to our knowledge, that we may and do, in a large measure, weave the web of our own life. That death being, for the most part, the result of influences by which we are surrounded, we have it greatly in our own power to make those influences conducive to life, or to

our destruction. Our habits either make or mar us. Our eating, our drinking, our clothing, our personal cleanliness, our school rooms, our church buildings, and even our legislative halls; the air and situation of our houses, our houses in their construction, material arrangement for heating, lighting, and ventilation—their very newness; our occupation, our education, etc., all alike have an influence for good or for evil, and all alike come strictly within the province, within the legitimate consideration of the vital statistician."

It is, therefore, to be hoped that our Legislature will give this most important subject its earnest attention and consideration, and so alter and amend our laws relating to health, that sickness and the suffering consequent thereto may be lessened or averted, the rate of our mortality diminished, public health improved, and human life prolonged. We have no hesitation in saying that this result can be in time attained by the compulsory appointment of local Boards of Health in every town, a systematic registration of births, marriages, and deaths, and an empowering of the State Board of Health to enforce, by legal notification or otherwise, whatever sanitary or health laws are neglected or ignored by those whose duty it is to see them faithfully executed.

#### VACCINATION.

In this century the efficiency of vaccination as a prophylactic against smallpox needs no verification or elucidation by argument. The civilized world acknowledges it; there only remains, therefore, to us, the question: How can the adoption of this inspired discovery of the immortal Jenner be made universal over the State of California? As Californians we are particularly interested in this question, as we are especially exposed to a visitation from smallpox, owing to our international relations with those countries where smallpox is, we might say, endemic. Mexico, with which we are related by land and sea, is at this present writing having an epidemic of smallpox in Guaymas. Japan, another neighbor, is also suffering just now from smallpox. The Sandwich Islands are not unfrequently visited by this disease, and in China it is endemic in many of the interior cities. These sources of infection, together with our constant interstate communications, completely encircle us with possible means of contagion, against which we must protect ourselves.

Quarantine may be and is frequently evaded. Sanitary precautions to isolate and prevent the spread of disease is not always successful, by reason of carelessness or inefficient action, or some fortuitous accident may evoke the disease from some source the possibility of which may have been forgotten, and the box of Pandora be opened to spread havoc and dismay among us. Happily, hope lies at the bottom, and its beneficence is realized by vaccination, which should be extended to the thousands of unprotected persons now living upon this coast, and the other thousands who are ever liable to the disease by reason of the prophylactic power of vaccination having become exhausted in their systems through age.

The question of compulsory vaccination, except in time of epidemics, is one that has lately been given great prominence by the epidemic in Montreal. It has been estimated that the money value of the business lost by reason of that epidemic was many millions, and when business values are brought into competition with disease then you will find that business will compel disease to keep in the background if it can be done by so simple a proceeding as vaccination. The policy of compulsory vaccination is open to question, for the reason that the human mind revolts against what it

considers an aggression upon personal liberty, and consequently such a law would inevitably raise a host of objectors, or anti-vaccinationists, as it did in England when compulsion was tried. We do not desire to raise any such antagonism here, and therefore will be content for the present if our Legislature will pass a bill making it compulsory on every child, before entering any public school in the State, to be vaccinated. This, in time, will vaccinate the next generation of Californians, and diminish the supply of material which otherwise would surely exist. The passage of such a law would not be compulsory upon those who preferred that their children should not receive the benefits of protection, as they could send them to private schools; but certainly we have no right to permit any person partaking of public benefits to imperil the lives of others by his ignorance, perversity, or captious stupidity.

In Canada, vaccination is compulsory on all, and any Health Officer can demand the exhibition of the certificate of vaccination, and has the right to examine every person to ascertain that the same has taken place; and further, any person coming from a locality where smallpox exists, must not only produce a certificate of vaccination, but also a certificate that he or she has not been exposed to the contagion within fifteen days preceding; failing which, it shall be the right of the Health Officer to forbid such person to enter or depart, as the case may be.

In Rhode Island, "no person shall be permitted to attend any public school in the State as a pupil unless such person shall furnish to the teacher of such school a certificate of some practicing physician that such person has been properly vaccinated, as a protection from smallpox, and every teacher shall keep a record of the names of such pupils in their respective schools as have presented such certificate. Every person violating any provision of this chapter shall be fined not exceeding fifty dollars, or be imprisoned not exceeding thirty days, unless otherwise herein provided."

In Connecticut, "Boards of Health may adopt such measures for the general vaccination of their respective towns as they shall deem proper and necessary to prevent the introduction or arrest the progress of smallpox. Every person who shall refuse to be vaccinated, or prevent any person under his care or control from being vaccinated, on application being made by *any member* of the Board of Health, or by a physician employed by the Board of Health for that purpose, unless in the opinion of another physician it would not be prudent on account of sickness, shall forfeit five dollars to the town where the offense was committed. Every person who shall violate any provision of the preceding sections of this chapter, or legal order of the Board of Health, for which no other penalty is provided, shall be fined not exceeding five hundred dollars, or imprisoned not exceeding six months, or both."

In Massachusetts, parents and guardians shall cause their children and wards to be vaccinated before they are two years of age, under a penalty of five dollars for every year's neglect. The Selectmen, Mayor, and Aldermen, shall require and enforce the vaccination of all the inhabitants when in their opinion the public health requires it, and the revaccination of all the inhabitants who do not prove to their satisfaction that they have been successfully vaccinated or revaccinated within five years, under a penalty of five dollars.

In New Jersey, School Trustees may prohibit the attendance of any unvaccinated child who has not had the smallpox, and shall decide how far revaccination shall be required if a case or cases of smallpox have occurred in the city or district.

Illinois has decreed that no pupil shall be admitted into any of the public schools of that State without presenting satisfactory evidence of proper and successful vaccination.

I cite these examples from other States to show that this Board is not asking any unreasonable legislation upon this most important subject, but simply following what experience has demonstrated as a feasible way of protecting the rising generation from a disease otherwise almost unavoidable if once it appears in a community. As is well said by Professor Brewer in the last report of the Connecticut State Board of Health, in speaking of public vaccination:

Abundant experience shows that there are enough persons in every community who neglect vaccination for themselves or their families at their private expense, to leave a large enough number of unprotected people to have material for an epidemic of smallpox if it once gets well started. And as vaccination is the only means yet devised to practically prevent occasional epidemics, and the consequent destruction of property or loss of business, therefore it is lifted into the category of public works for the public's good. It is something belonging to the community to do for its own protection, as much as would be the building of a dike or dam to protect the property of all the citizens in common from some common danger. As to the rights of compulsory vaccination, I have no doubts whatever, and such right will exist so long as a community has the right to protect itself from any enemy.

Fortified by expressions such as these and indorsed by the experience of those States and countries where universal vaccination is the rule, we confidently rely upon our coming Legislature to give us such protection to our State from the ravages of smallpox as can be insured by vaccination, at least, of our public school children. The effect of this law would be to eliminate, in time, those senseless objectors who now render universal vaccination impossible, and produce, in their stead, a race of individuals who, having in their own persons experienced the beneficent protection cast over their lives by this God-given gift, would be only too willing to confer the same immunity from a loathsome disease upon their children.

#### QUARANTINE.

The subject of quarantine has engaged the attention of this Board for many years, but so far without any palpable result. This session of the National Congress we presented a bill for protecting the State of California from the invasion of infectious and contagious disease, by establishing a quarantine station in San Francisco Bay. This was forwarded to our representatives, and received their unanimous indorsement and promise of assistance in procuring its passage. So far, it has been referred to the committee, where it remains until reported back. The probabilities are that no action will be taken on it this session. We are, therefore, practically defenseless, in a measure, against the importation of infectious disease. The duty of Congress in this matter is admirably defined by Dr. John H. Rauch, Secretary of State Board of Health of Illinois, in his address upon "State Medicine," before the American Medical Association, at its meeting in May, 1886. He says:

One thing remains clear. Whether by the rehabilitation of the National Board, or by the creation of a new organization, it is the imperative duty of Congress to complete the health defenses of the country. Municipalities have their legitimate sphere, within which they alone can act and are responsible, and next beyond which the authority and resources of the State are demanded. But neither municipalities or States can protect themselves against foreign pestilences without the assistance of the National authority, nor can they properly guard themselves against interstate infection or contagion without the cooperation of the same authority.

In speaking of his tour of inspection of the quarantine maintained upon the Atlantic and Gulf Coasts, from the St. Lawrence to the Rio Grande, he says:

I am more than ever convinced since completing this inspection that Asiatic cholera, as well as smallpox and yellow fever, may be effectually excluded from the United States by an intelligent use of the agencies still at our command. This is not a matter of speculation or theory. A great advance has been made in practical sanitary science since 1878, notably in the administration of the maritime quarantine generally, and especially in the improved safeguards at the mouths of the St. Lawrence and the Mississippi. A quarantine of exclusion of the three principal epidemic diseases is now a matter of certainty, dependent upon prompt notification of threatened danger; vigilant supervision over commercial intercourse with infected localities; inspection of all immigrants and the enforcement of their vaccinal protection; sanitation and purification of infected vessels and cargoes; isolation of those sick with these diseases; the surveillance of suspects during the period of incubation; and the employment of other well defined preventive and precautionary measures, which now constitute the best modern sanitary practice as applied to maritime quarantine. It must be repeated, however, that the coöperation of the National Government with State and local authorities, as well as its independent action in matters beyond the reach of States and municipalities, are indispensable to the proper protection of the public health. The duty of Congress in this connection is even more pressing than the responsibility of providing defense against an armed enemy. The latter is a more or less remote contingency, but the assaults of foreign pestilence are constant and continuous.

This quotation from Dr. Rauch's admirable address gives his impressions after a visit along the eastern coasts where quarantine is vigorously enforced. Had he visited the Pacific Coast and seen how inadequate are our resources to deal with an invading enemy, his language would have been still more vigorous, and if possible more emphatic. If Congress fails this session to pass our quarantine bill, our only resource will be another appeal to our Legislature to appropriate a contingent fund to meet any emergency that may arise to threaten the health and lives of our fellow citizens by land as well as by sea. In truth, there should be at all times at the disposal of the Governor a contingent fund which could be used at the request of the State Board of Health in times of threatened danger upon our borders; and it would be an act that would meet the approval of every thoughtful citizen upon this coast, if the Legislature at its coming session would appropriate a sufficient sum to defray all the necessary expenses incidental to placing a quarantine upon those borders of our State which are threatened by the invasion of contagious or infectious diseases. Yellow fever, smallpox, and cholera can be prevented from entering California by a proper quarantine; and the amount of money spent in prevention would be but the merest pittance compared with the monetary loss, to say nothing of human life, which would accrue to the State by the entrance into it of any one of those diseases. It is incomprehensible how legislators can be so blind to the interests of California as to refuse this safeguard upon which depends the commercial prosperity and the individual security of its people.

#### MORTUARY STATISTICS.

As heretofore mentioned in the preceding pages of this report, the very unsatisfactory and defective plan at present existing for carrying out the registration laws, prevents my presenting to your Board the mortuary statistics of the State in any one sense complete. Our registration laws must be amended before we will be enabled to apply them with any degree of success to accomplish the design for which they were enacted. For the statistics which are here presented, I am indebted to the untiring kindness, courtesy, and in many cases self-sacrifice of the members of the medical profession throughout the State, whose names it has given me great pleasure to record in another part of this report as exemplifying the fact, that the



character for philanthropy which distinguishes the medical profession from all others, is not wanting in those of California. From the imperfect reports collected from June 30 to December 31, 1884, we find that there were recorded three thousand two hundred and eighty-one deaths, inclusive of one hundred and forty-one still-births. During this six months there were four hundred and ninety-two deaths from zymotic disease. Of these, one hundred and eighteen were children under one year of age, and one hundred and thirty-nine under ten years of age, which shows that of all the deaths from preventable disease very nearly one half were in children under ten years of age. *Typhoid fever*, during the six months, is credited with the highest mortality among the zymotic type of diseases, being one hundred and one; seventeen being under ten years of age. *Cholera infantum* stands next in the list of decedents, having a record of eighty-one deaths. Of these sixty-five were under one year of age, and sixteen under five years. *Diphtheria* is credited with sixty-six deaths, forty-eight of which were under ten years of age, and fourteen under twenty years, leaving but four decedents over that age; three of these were under thirty years of age, and one under forty years, exemplifying in a striking manner the infrequency of death from this disease in adult life. *Croup* caused twenty-eight deaths, all under twenty years of age. *Diarrhœa* and *Dysentery* are recorded as fatal in fifty-eight instances. *Scarlet fever* caused seventeen deaths. *Measles* had only six deaths, and *Smallpox* caused the death of one.

Among the *constitutional diseases* we find *Consumption* exceeding all other causes of death, numbering for the six months four hundred and eighty-one, which is about the general average for several years past. *Marasmus*, closely allied, if not identical with tubercular disease elsewhere, caused one hundred and one deaths, ninety-two of which were under one year of age. *Meningitis*, another ally of the same diathesis, is credited with producing seventy-eight deaths, fifty-five of which were under five years of age. *Cancer*—To this disease ninety deaths were attributed during the six months, representing but few localities. The local diseases swell the mortality list even more than the zymotic, nine hundred and forty-five deaths being the result of local disease. *Pneumonia* heads the list with one hundred and sixty-six deaths. *Bronchitis* had sixty decedents, and other diseases of the respiratory organs sixty-seven deaths. Diseases of the alimentary canal, including *peritonitis*, number two hundred and one. *Nephritis*, including *Bright's disease*, caused seventy-one deaths, and *Heart disease*, including *Aneurism*, two hundred and ten.

As this retrospect of the mortality of the latter half of eighteen hundred and eighty-four is, from the number of missing reports, rendered useless for comparison with the six months preceding it, it will suffice to say that of the thirty-two hundred and eighty-one deaths recorded, seven hundred and sixty-five occurred in children under five years of age, a percentage of 2.33 per thousand, which when compared with the death rate in other States is not an excessive percentage. From what we can gather from the scattered reports of 1884, the condition of the State was one not marked by any special epidemic, or unwonted increase in the record of zymotic disease. At this time the number of correspondents was very limited, and did not fairly represent the whole State; but what reports were received indicated that the condition of the public health during this period was quite favorable. In the succeeding six months of the fiscal year, from January 1 to June 30, 1885, the number of correspondents had been increased very materially, and consequently the returns of deaths were likewise augmented. We find that for the last half of the fiscal year four thousand nine hundred and



fifty-seven deaths have been recorded. Of these, one hundred and fifty-three were still-births, and nine hundred and nineteen the result of zymotic disease, or at the rate of a fraction over 18 per cent of the total mortality, which is a slight tribute to the effect produced by the increased cleanliness which may be claimed as a result of the repeated warnings of your Board to prepare for an invasion of the cholera which was then expected. Of these deaths one hundred and sixty-three were infants under one year of age, two hundred and forty-one were under five years, one hundred and twenty-seven under ten years, and fifty-four under twenty years of age; or, in other words, five hundred and eighty-five of these deaths from preventable disease were under twenty years of age.

Of these victims to sanitary ignorance or neglect, seventy-two were carried off by *Cholera infantum*, the greatest mortality being in the Summer months, when the weather was exceedingly warm. Forty-eight deaths of infants were ascribed to *Diarrhœa* and *Dysentery* during the same period. Seventy-eight deaths occurred from *Measles*, which is a large increase from the previous six months. We must, however, remember that this report embraces a very much larger area than that of the previous six months, and also that portion of the year during which this exanthem was most extensively prevalent. *Scarlet fever* likewise exhibits an increased death rate from like causes, the mortality being forty-three. It did not prevail, however, as extensively as measles, and its type was mild.

Of *Smallpox* there was not a single case in the State during the time herein embraced. *Diphtheria* shows the very much increased mortality of one hundred and thirty-three over the previous six months, which was only sixty-six. This increase of deaths is partly owing to the larger extent of country heard from, and partly to the increased spread of the disease. The diffusion of sanitary knowledge by your Board, and the increased vigilance of our correspondents in isolating the cases that come under their care, and teaching their patrons the necessity of perfect cleanliness of person and surroundings, have done much to limit the disease in many localities. With increased powers, more undoubtedly could be done to arrest its spread, but without judicial authority advice is all that can be offered at the present time. The semi-annual mortality from *Croup*, which is now regarded by very many competent authorities to be diphtheritic in its nature, is also largely increased, being one hundred and eight, or eighty-one less than that from diphtheria. A curious and suggestive fact has been noticed by the writer, which may add some weight to the opinion expressed by those who believe in the identity of membranous croup with diphtheria, that whenever a report was received announcing a death from membranous croup, in the card mentioning the "prevailing diseases," diphtheria was almost invariably one of them. *Whooping-cough* seems to have caused twenty deaths, which may perhaps be accounted for by the prevalence of measles, as the infection of the one is often not perceived until the rash has passed away, leaving the infant or child in such a debilitated condition as to be unable to resist the exhausting effect of the prolonged and suffocating cough. This theory is somewhat supported by the fact that but six deaths occurred from measles during the previous six months, and only three deaths from whooping-cough. *Enteric*, or *Typhoid fever* caused the death of one hundred and twenty-one persons, being sixty-eight times less fatal than diphtheria during the six months. This is rather an alarming fact, when we consider the frequency of typhoid fever compared with diphtheria, and shows how much more to be dreaded is an epidemic of diphtheria than that of typhoid fever. Our reports, however,

show that whereas diphtheria is more fatal between the ages of one and fifteen years, typhoid fever causes its maximum of deaths between fifteen and forty years of age.

The subject affords the sanitarian an extensive field for investigation, as each case is a study in itself, and requires careful examination to solve the problem of causation. *Typho-malarial fever*, for which some authors claim a special entity, had a fatality of three, which is but a nominal death rate for so serious a disease. *Remittent* and *Intermittent fevers* are credited with thirty-six deaths, which is a slight increase over the preceding six months, if the localities heard from were equal in number, which they are not, and therefore no deduction as to relative mortality can be safely drawn: the same observation will apply to *Cerebro-spinal fever*. Among the forty-one cases recorded of this disease for the six months, eleven were infants under one year of age, and of the thirty-two recorded the previous six months, thirteen were under the same age. We may be fairly permitted under these circumstances to express a doubt of the accuracy of the diagnosis in these cases. Cerebro-spinal fever being in the experience of the writer rather a rare disease in infancy, although it is not by any means unknown to occur even on this coast among infants, yet three and one half per cent of all the cases registered seems too large a percentage of deaths at this age to render the diagnosis as probably correct. This is one of the great drawbacks to statistics of this kind, as we have no means of knowing positively, or even probably, whether the recorded cause of death is reasonably true. For instance, not long since I was called in consultation by a physician to see what he called a case of cerebro-spinal fever in an infant eight or nine months old. To my surprise I found a case of well marked nasal and pharyngeal diphtheria. The nares were so obstructed by the diphtheritic deposit that the infant had to keep its head well thrown back in order to breathe, hence the diagnosis of cerebro-spinal fever, which had no existence. Many errors like this are recorded, and I suppose will ever be inseparable from statistics until medical education is more uniform, and the practice of medicine more scientific and less empirical. Of *Meningitis*, tubercular, and otherwise, among the constitutional diseases, there are recorded one hundred and thirty-six deaths, and of hydrocephalus, twenty-one. In the preceding six months the deaths from meningitis were seventy-eight, which would indicate that the heat of Summer and Fall was less productive of this inflammatory condition of the brain than the cold of Winter and the variability of Spring, if meteorological conditions can be admitted into the chain of causation which environs this disease. Among the diseases affecting the respiratory system, *Consumption* was the cause of the greatest mortality, some seven hundred and forty-six deaths from this disease being recorded, or two hundred and sixty-five more than the preceding six months. The large mortality from consumption is accounted for by the continuous stream of sufferers from this affection that is constantly pouring into the State with the fond hope of at least relief, if not cure. Of these seven hundred and forty-six decedents, only one hundred and forty-eight were born in the Pacific States, many of them coming from Oregon, Washington Territory, British Columbia, and other northern countries, to seek the genial climate of California, and strangely confident of relief even in the last stages of the dread malady. Among the local diseases *Pneumonia* heads the list with three hundred and eighty-six decedents, which is double the number of those recorded for the preceding half year. The Winter and Spring months here, as elsewhere, show the greater mortality from this disease. If, as Professor D.

Draper, of New York, surmises, there is a connection between climatic conditions and the death rate from pneumonia, and that the mortality varies with the amount of ozone in the atmosphere, being greatest with an excess of ozone at a low temperature, and least when ozone was smallest in quantity, it would be a study of much interest to either corroborate or deny these assertions by a daily record of the meteorological conditions of the atmosphere upon this point, and compare the results with the death rate from pneumonia. Bronchitis, likewise, by strange coincidence, shows twice as many deaths during the same period, but whether this was owing to the same cause or climatic conditions cannot be definitely ascertained. Bronchitis prevailed quite extensively during the Winter of 1884-85, as did also influenza. As this review includes only the very imperfect returns of the Fall of 1884, and the more numerous reports of the first half of 1885, we may perhaps be able to present you in the synopsis of the fiscal year ending June 30, 1886, with a more extended report of the mortality occurring in the State during that period, as the districts heard from will embrace a larger area of country than heretofore, having now established correspondents in every county in the State, including some hundred localities which are heard from every month. This area contains an estimated population of over half a million of inhabitants, and may be taken as a fair index of the general condition of the public health for the period named.

#### REVIEW OF 1885 AND 1886.

The mortality for the fiscal year ending June 30, 1886, shows a material increase over that of the previous year, which is explained by the increased sources of information from which we derive the fact, and therefore cannot be fairly attributed to an increased death rate over previous years. The number of deaths recorded for the fiscal year ending June 30, 1886, aggregate nine thousand seven hundred and fifty, inclusive of two hundred and sixty-six still-births. As this aggregate of mortality represents only that occurring among a little over one half the population of the State, inclusive of the larger cities, we perhaps would not err very much in estimating the deaths not recorded as eight thousand; or, in other words, we may fairly be justified in placing the death rate of the entire State at eighteen per thousand. If our means of obtaining a record of all the deaths that occur in the State were such that a correct list would be possible, we would most probably find that the death rate did not exceed fifteen per thousand, as the places unrecorded now are small towns, villages, and scattered hamlets, where the death rate is very low indeed. The past year was not marked by any epidemic disease within the State. On the contrary, the public health, as judged by the various reports received, was above the average. We may, I think, justly attribute this immunity from disease to the general precautions taken throughout the State to be prepared for the invasion of cholera. This necessitated a general sanitary inspection, which, added to the potency of fear, gave an impetus and generalization to the work which has demonstrated so satisfactorily its value. Happily cholera did not make its appearance this Summer, but the work done in its anticipation has, it is sincerely hoped, taught the people of California a more eloquent lesson upon the necessity and priceless value of perfect cleanliness than any amount of mere book reading upon the subject of sanitation. They can see for themselves the fact demonstrated how sanitary measures have preserved the health of their cities and towns, and saved hundreds of

lives that otherwise would have been needlessly sacrificed upon the altar of uncleanness.

In reviewing the causes of mortality, we find that consumption causes three times more deaths than any other disease upon the coast. This apparent tendency to death from lung disease, tubercular in nature, in California, is not attributable to the climate or the environment of its people, as there are no people that have the blessings of a more diversified climate than ours, and no people who are better fed, better clothed, and better housed than the generality of Californians. Our mortality from consumption arises not from intrinsic causes, but extrinsic. We are here the recipients of thousands of tubercular men and women who seek these shores in hope of delaying the progress of this fell disease, and of whom a large number, who come early in the disease, succeed; others come here to die, as no climate is possible to restore to these sufferers their health. This class is the most numerous, and they are found in the southern counties in hundreds; hence the great mortality from consumption noted in Los Angeles, San Bernardino, and other southern towns which have become famous as health resorts. Consumptives congregate there, attracted by the salubrious climate and the balmy air of these famed spots on earth; death, nevertheless, follows them, and they swell our bills of mortality month after month. The large death rate from this disease merely shows then the number of those so afflicted who visit our coast in the vain hope of recovery, and must not be taken as an index of our climate as a predisposing factor in the etiology of the disease.

#### PNEUMONIA,

Or inflammatory disease of the lungs, caused a little less than one third of the deaths attributed to consumption; yet the mortality was much greater than any other local disease affecting the human system, the deaths being six hundred and four, a percentage of 6.2 of all the deaths recorded. Pneumonia has not been epidemic anywhere on the coast, but prevailed quite extensively in San Francisco during the Winter and early Spring months. The disease is noticed as more likely to develop upon the seacoast and the higher altitudes, where the temperature is lower and the moisture more permanent, than in the warmer interior valleys, where extreme vicissitudes of temperature are rare. The cases are all sporadic, and what is known as infectious pneumonia is rarely seen.

#### BRONCHITIS.

The deaths attributed to this disease during the past year have been one hundred and ninety-four, of which number seventy-four were children under five years of age. The months showing the highest death rates were December, 1885, and January, 1886, when they reached twenty-two in each month, respectively. The lowest death record was in June, 1886, when the number of decedents was six. Bronchitis, like pneumonia, is much more prevalent along the seacoasts, and especially those parts where cold and damp fogs are frequent, than it is in the warmer valleys, or even in the higher altitudes. When the snow line is reached we find that from it upwards the tendency to bronchitic affections increases in Winter and decreases in Summer, which indicates that the relations which bronchitis bears to meteorological conditions are well marked, and that the range of temperature, the humidity of the atmosphere, and the presence or absence

of fogs and cold winds, influence in a striking manner the advent of the disease.

#### DIPHTHERIA.

This formidable disease, which seems to keep pace with the footsteps of civilization and take up its abode wherever a civilized society exists, has not spared California for the past year, having made a record of three hundred and seventy-four deaths. If we add to these those not recorded, but which undoubtedly took place, we are startled at the mortality caused by this preventable disease. No less than three hundred and thirty-two of these recorded victims to unsanitary surroundings were under twenty years of age—some in infancy and some just dawning into manhood and womanhood. The previous year the deaths were two hundred and sixty-five, with two hundred and forty-eight under twenty years of age. The greatest number of deaths occurred in San Francisco, where the disease prevailed more or less during the entire year. There were sporadic cases here and there throughout the State, which were for the most part imported from other places. Meteorological conditions seem to have but little influence in determining the accession or recession of the disease, as we find exactly as many deaths recorded in July as we do in January. The smallest number took place in June, numbering eighteen, the next smallest number, nineteen, being recorded in March; in April the deaths were twenty-six, and in May thirty-one. In the warm and dry months of Summer the average death rate was one hundred and eighty-eight, and in the rainy, cold, and damp months of Winter the deaths numbered one hundred and eighty-six, showing an increase of two in favor of Summer. In croup the same comparison does not hold good, as we find in this disease that sixty deaths took place during the Summer months and one hundred and six during the Winter, but as this table includes those children who die of spasmodic croup as well as membranous croup, we might expect an increase of deaths in Winter, when bronchial diseases are so prevalent and spasmodic croup so frequent.

#### SCARLET FEVER.

The fatality of scarlet fever for the past year has been extremely limited, sixty-five deaths only being recorded in a population averaging over half a million. The greatest mortality in any one month was in December, when fourteen deaths were recorded; the next highest being January, which had eleven deaths. According to our tabular list this disease seems to have been more fatal during the Winter months than in the heat of Summer, as we find but seven deaths in May, three in June, none in July, one in August, and two in September; in October it rises to six, November six, and December fourteen. The disease, wherever it has occurred, according to the reports of our correspondents, has been of a mild type, with none of that virulence which has sometimes been witnessed in California during past epidemics. The carelessness with which those sick of the disease have been allowed to mingle with the well has been a fruitful source of spreading the disease; and when we recollect how long the germs of scarlet fever will lie dormant and yet continue in potential life, we are not surprised to see the disease appearing year after year in those places where sanitary measures for its eradication are neglected.

Among the curious discoveries of the past year in relation to the causation of scarlet fever is that of Dr. Klein and Mr. W. H. Power, of London, the

latter being one of the Health Inspectors in the service of the local Government Board. The story is thus told in the *Medical Press*:

Towards the end of 1885 an epidemic of scarlet fever occurred in certain districts in northwest London, and a very carefully conducted inquiry led to the discovery that all the sufferers derived their milk supply from a particular farm, situated at Hendon; but it could not be ascertained that any case of the disease had existed anywhere near this particular farm at a date sufficiently recent to admit of its being admitted as the contaminating source of the outbreak following the use of the suspected milk. Additional and irrefragable proof that it was this fluid, and this alone, which was answerable for the epidemic, was afforded by the fact that on a certain occasion a quantity of the milk was returned to the farm by the retail dealer to whom it had been distributed, with a view to its being thrown away as dangerous. A number of poor people hearing of the contemplated waste, as they considered it, then obtained surreptitious possession of the condemned material, which they proceeded to consume, and in due course many of the children to whom it had been given became the subjects of scarlet fever. This remarkable incident in the chain of events naturally excited the experts engaged in the investigation to still keener efforts in tracing the original source of the disease, and their attention was irresistibly attracted to the cows from which the milk producing such serious effects had been obtained. The result of their examination was the discovery that four of the animals were found to be suffering from a superficial ulceration of the udders and the hairy parts adjoining, the nature of the eruption being, however, so trivial as to have aroused no suspicion concerning it on the minds of the usual attendants. Inquiry and observation next established the fact that this eruption was communicable to perfectly healthy cows by contagion; and also, that only the milk yielded by animals affected with it was capable of producing the symptoms of scarlet fever among consumers of their milk. Two of the cows in question were purchased and removed to the Brown Institution, where Dr. Klein conducted a long series of experiments designed to test the properties of the secretion poured out by the ulcerations mentioned above, the result being one of those startling and epoch-making discoveries with which the student of modern medicine has been made familiar. Dr. Klein's experiments have shown that the virus (styling the *materies morbi* so far the moment) obtained from the cutaneous sores is capable of cultivation, after the method now so familiar to pathologists, and that the most favorable medium for its rapid development is milk; also, that it may be successfully inoculated on calves, and that after infection these exhibit the peculiar morbid changes in the kidneys which constitute the essential pathological phenomena of scarlet fever in the human organism. Further, it was demonstrated during the course of the experiments, that the character of the disease induced by direct contagion was of much less severity than that inoculated by the cultivated virus. \* \* \* For the first time in the history of preventive medicine we are enabled to entertain, without a suspicion of extravagance, the hope that by most simple and easily applied measures the risk of spreading a malady that is accountable for one death out of every thirty that are registered, may be entirely obviated, and that humanity will be in future relieved from a scourge that reacts with such distressing severity, especially upon the lives of the young.

I am constrained to quote this extract at length, it contains matter of such vital importance to the sanitarian. How many mysterious visitations of scarlet fever, which hitherto have baffled the strictest scrutiny and eluded the most searching inquiry might have been quickly discovered and traced to their original source in the light which has been shed upon this disease by the discovery of Mr. W. H. Power and Dr. Klein! If further investigation confirms the experiments of Dr. Klein, and the cause of scarlet fever be relegated to a source so obvious to the most inexperienced observer, then indeed may preventive medicine claim one of the greatest victories ever recorded in the history of medicine.

#### MEASLES.

Although measles has prevailed in a great many places in the State during the past year, nowhere did it attain the proportions of a dangerous epidemic. The highest mortality for any one month was in July, when the deaths from this cause reached ten; in August four, September three, October and November one each, and December none. The total deaths throughout the year attributed to measles were thirty-one. We are therefore justified in believing that the form of the disease was devoid of malignancy, and presented no features worthy of further note at present.

## WHOOPIING-COUGH.

This epidemic disease, which has elicited so much controversy in medical circles as to its nature and cause, prevailed in many places during the year, and was the occasion of the death of forty-seven persons, of whom one was over ten years of age; and one under twenty, the others dying in infancy. The relation which whooping-cough bears to measles has not yet been authoritatively defined, but some practitioners, as *Gérmain Sec* and *Gue-neau de Mussy* believe in the very closest relations between these diseases. We have observed that wherever measles prevailed the report was soon followed by that of whooping-cough, but as epidemic catarrh was also prevalent, the cough might, as *Dr. West* thinks, be evolved out of it and not out of the measles. If the parasitic nature of the disease be fully attested, it will mark another era in preventive medicine, as it will fall under those classes where isolation, with disinfection, is sufficient to stamp out the disease; or indeed it may be possible to cure it by the inhalation of some parasiticide, which, while not injuring the system, may be sufficiently powerful to destroy the spores without irritating the tissues.

## TYPHOID FEVER.

Of the zymotic diseases diphtheria caused the greatest destruction to life, and typhoid fever stands next in rank. Two hundred and fifty-seven deaths are ascribed to this disease, if we include in the estimate thirty-two cases of so called typho-malarial fever, which late authorities are willing to concede is neither more nor less than typhoid fever complicated with malarial saturation. Typhoid fever has not presented any epidemic tendency during the year, and the number of those sick from the disease has been rather below the average. The highest number of deaths in any one month took place in October, when thirty-eight deaths were registered. Of these thirteen occurred in San Francisco, the remaining twenty-five being scattered here and there over the State. We find that one hundred and thirty-one deaths occurred during the Summer and Fall months, and only ninety-four during the Winter and Spring months. The same coincidence is observed in the thirty-two cases of typho-malarial, eleven deaths taking place in Winter and twenty-two during the Summer, which, in a manner, tends to confirm the opinion of *Max V. Pettenhoffer*, that the prevalence of typhoid fever coincides with the rise or fall of the ground water, increasing as the water falls, and decreasing as it rises. *Dr. Henry Baker*, Secretary of the State Board of Health of Michigan, has observed the same coincidence; and the comparison of the meteorological and other conditions led him to conclude that no circumstances known to him varied in such a manner as to explain the unusual prevalence of typhoid fever in certain months, except the condition of the ground water as indicated by its lowness in wells. There hardly remains a doubt at the present time that drinking water is the source from which the great majority of attacks of typhoid fever arise. In Massachusetts, three hundred and ninety-three thousand cases of typhoid fever, with forty thousand deaths, have been traced to specific contamination of drinking water. The difficulty sanitarians have to meet in California, as elsewhere, is the sanitary ignorance of the people. You cannot persuade a farmer that his privy, situated ten, or twenty, or fifty feet from his well, could contaminate the water. He believes that the earth is a natural filter and cleanses from all impurities any fluid that might percolate through it into his well. If you tell him



the story of the outbreak of fever in Lausanne, where the infected water filtered through nearly a mile of porous earth and then became the cause of an outbreak of typhoid fever, he simply laughs at your credulity, and continues to build his outhouses and his privy in the closest proximity to his dwelling. There is no remedy for this except education and the constant teaching of sanitary science in popular form. When people begin to realize that *clear* water is not always *pure* water, and that water in wells that are situated near the kitchen and outhouses are sure to be contaminated by the slops from the kitchen and the sewage from the outhouses, and that the lower the water gets in the well the more unwholesome it becomes, we may then look for a diminution of typhoid fever, both in the numbers of those attacked and in the fatality of the disease.

#### REMITTENT AND INTERMITTENT FEVERS.

The fatality from these diseases reached the number of forty-seven, the great majority being from remittent, or so called bilious fever. The highest death rate in any month being six, the mortality can truthfully be adjudged as small when we consider the number of persons that yearly suffer from paludal fevers. It has been noticed that malarial fevers have increased in those sections of country where irrigation has been inaugurated to increase the fertility of the soil. Pernicious fevers are, however, rare in California, and very seldom, indeed, is the algid form witnessed. The ordinary forms of paludal fevers yield readily to quinine, and those living in regions where they prevail seldom call a physician to their aid, being content to take their quinine with their coffee as a morning beverage.

#### DIARRHŒA AND DYSENTERY

Have prevailed to a greater or lesser extent throughout the year, but not in what might be termed an epidemic form; they are credited with causing one hundred and sixteen deaths, the largest number in any one month being thirteen from diarrhœa in October, and eight from dysentery in September—the average being a trifle over six a month from diarrhœa, and a little over three a month from dysentery. During the Summer months, diarrhœa was especially prevalent; the type was exceedingly mild and easily controlled by simple remedies. The same may be said of dysentery, which in no section of the State showed an epidemic tendency.

#### CHOLERA INFANTUM.

Deaths from this disease reached one hundred and sixty-nine during the year, and was particularly fatal during the Summer months, reaching as high as thirty-one in June and August, and thirty in October. The high temperature during these months, the abundance of fruit, the tendency that the milk of cows fed on green alfalfa has to give diarrhœa to infants, may be held responsible for this mortality, and if, as held by V. C. Vaughan, M.D., Ph.D., Professor of Chemistry in Michigan University, that tyrotoxicom may be produced by certain changes taking place in milk, and this product is poisonous, there is no reason to doubt that many of these rapidly fatal cases may be caused by this ptomaine. Indeed, I find that in the proceedings of the Michigan State Board of Health for July, 1886, Professor Vaughan calls attention himself to this fact. He says, in speaking of cholera infantum:



We shall find its similarity to poisoning by tyrotoxin very marked. The suddenness and violence of the attack, the nausea and vomiting without marked tenderness of the abdomen, the character of the stools, the great thirst, the severe pain in the back of the head, the nervous prostration, and the tendency to deep sleep, are all observed in both. Again, the white, soggy appearance of the mucous membrane of the stomach of the cat corresponds exactly with observations upon children after death from cholera infantum. Cholera infantum, as stated by Smith, is a disease of the Summer months, and, with exceptional cases, of the cities. Thus, the disease occurs at a time when decomposition of milk takes place most readily. It occurs at places where absolutely fresh milk often cannot be obtained. It is most prevalent among classes of people whose surroundings are most favorable to fermentative changes. It is most certainly fatal at an age when there is the greatest dependence upon milk as a food, and when, on account of the rapid development of intestinal follicles, there is the greatest susceptibility to the action of an irritant poison, and when irritative and nervous forces are most easily induced. If all these facts be taken into consideration, along with the experiments detailed and which show the readiness with which the poison can be generated, it will certainly seem at least palpable to any one that tyrotoxin may be a cause of cholera infantum.

The conclusions to which Prof. Vaughan's experiments with ice cream, cheese, etc., have led him, certainly bear the impress of truth. It is very certain that milk taken from a cow that is fed on green alfalfa will produce the most violent diarrhoea in some infants, and it is no less certain that milk that has undergone or is undergoing putrefactive change, will almost invariably produce symptoms of cholera infantum. In the formation of tyrotoxin we may have the solution, and if so, the remedy is apparent.

#### THERMIC FEVER OR SUNSTROKE.

There was one death recorded from sunstroke in June of this fiscal year. Some cases occurred subsequently, but cannot be further referred to in this report. In all the cases of sunstroke reported by this Board, now numbering ten since 1870, we find that all occurred in the months of June or July, which mark, probably, the warmest months in the year. The influences upon which we have hitherto relied as affording protection from sunstroke, dryness of atmosphere and coolness of evenings, seem to be powerless in the presence of great heat acting upon individuals who are unaccustomed to its influence. In the case mentioned in this report, the decedent was a man just arrived in California from a cold climate. Incautiously he went to work at once in the hot sun. On the second day he was stricken down unconscious, and died in a few hours. The majority of deaths from heat apoplexy occur in men of intemperate habits, whose blood is in a condition to rapidly absorb heat and repress elimination. Nevertheless, sunstroke is a comparatively rare occurrence in California, as the reports of the Board of Health for the past fifteen years show conclusively, and would probably never occur if those whose duty compels them to labor under the influence of the sun's rays would use ordinary precautions in pursuing their labor. It might, perhaps, be well for the State Board of Health to issue a circular upon this subject before another Summer comes, as the densest ignorance seems to prevail among newcomers upon the danger to be apprehended from insolation, and the means to be used for restoration in case of attack.

Before closing this report, we must not fail to call attention to the obligations we are under to

#### OUR CORRESPONDENTS.

The number of gentlemen to whom we are indebted for much of the information contained in this report has been greater the past year than ever before known in the history of this Board. This, in itself, is a gratifying instance of the progress of sanitary science, and assures us of the interest taken in the work of the Board. To these collaborators with us we

owe the knowledge that we possess of the various diseases that have prevailed from month to month throughout the State; and, deprived of their generous aid, the efforts of this Board to extend the knowledge of sound sanitary principles among the people would have proven a comparative failure. By no other means, as the law now stands, was it possible to obtain, from time to time, the information of which we stand in need concerning the sanitary conditions prevailing in different parts of the State; and to these same gentlemen, likewise, is due the credit for whatever mortuary statistics we have been able to collect. When we recall the fact that all this varied and essential information is contributed voluntarily and, in many instances, at considerable trouble and inconvenience to the contributors, without fee or reward other than that pertaining to the consciousness of adding to the sum of human happiness and the well-being of their fellow men, we cannot but be impressed with reverence for a profession that can furnish such instances of purely unselfish philanthropy, that inures not to its own pecuniary benefit, but exactly the reverse, in order that man may be made happier and his life prolonged in health, during his transit through life's wilderness.

To those gentlemen who have favored us we desire to return our personal thanks and the thanks of the State Board of Health, and trust their numbers will keep increasing until every town and village, as well as city, in the State will be in direct communication with this Board, through its medical correspondent. To those gentlemen who have contributed so liberally to the literature of the report the Board also desires to express its thanks. All of the reports will be found of great interest, and many of them of more than ordinary value in illustrating the topography and climatology of California. Our acknowledgments are especially due to the officers of the Signal Service for the very complete tables of the rainfall on the Pacific Coast, embracing many years, and also for the instructive tables of the rainfall for each month during the seasons of 1885 and 1886. These tables have not heretofore been published, and are a most valuable contribution to our work and the meteorology of the Pacific Coast. To Lieutenant W. A. Glassford, of the Signal Corps, U. S. A., in charge of the Pacific Coast Division, we are indebted for the preparation and the privilege of producing them in our report. To Sergeant James Barwick, U. S. Signal Corps, the efficient officer in charge of the Signal Office in this city, we are indebted for the review of the meteorological condition of Sacramento from January, 1885, to August, 1886, showing the temperature, rainfall, velocity of wind, etc., which will prove of great interest to those living in the Sacramento Valley, or those intending to locate there. He has also kindly furnished us with tables of the average annual and seasonal temperatures for the past thirty-three years, as well as the rainfall from September, 1849, to August 31, 1886.

We are glad to return to these officers the thanks of the Board for their valuable contributions, and to express our appreciation of the great services rendered to our people by the Signal Service Corps throughout the State.

Attention is likewise called to the exceedingly valuable paper contributed by Dr. Wolfred Nelson, on "Yellow Fever in its Relation to California." From Dr. Nelson's long experience in the midst of this disease in Panama and Mexico, anything from his pen upon this subject may be looked upon as thoroughly reliable, and the Board is under many obligations to him for this expression of opinion upon a theme of such vital importance to California.

Attention is also desired to the valuable essay of Dr. Sternberg, U. S. A., which, through the kindness of Dr. Irving A. Watson, Secretary of the State Board of Health of New Hampshire, we are enabled to reprint in our report.

To each and all of these valued contributors to sanitary science we again tender our warmest thanks for such efficient aid and hearty coöperation in our work, and trust it will mark the dawn of a new era in the sanitary history of California.

#### THE PRESS.

It is with great pleasure that the attention of the Board is called to the obligations under which it has been laid by the newspaper press throughout the State. Through this powerful lever of public opinion the State Board of Health has attained a prominence which, through any other channel, would have taken years to accomplish. Whenever it was deemed prudent by the Board to call public attention to any threatened epidemic or sanitary need, the press at once lent its ever efficient aid in giving publicity to our warning or advice. In the most courteous and generous manner it gives a large circulation to our "Monthly Circular," through which such an interest in sanitary matters is created that the public look for the circular, in order to obtain the most reliable information concerning the health of the State. Through these means public education in sanitary needs is being accomplished, and the State Board of Health obtaining a place in public estimation which will insure its future success. The study of general sanitation and domestic hygiene is receiving marked attention among the more intelligent portion of our people; indeed, a pleasant revolution is taking place upon these subjects. The work of the plumber has now been advanced into the domain of science, and we sincerely trust the day is forever past when our lives will be threatened within our very thresholds and round our domestic hearths by the ignorance or cupidity of unskillful workmen. The public, in these matters of domestic hygiene, is getting better and better informed daily, and the appointment, in every well ordered town, of Inspectors of Plumbing, to insure the proper performance of the work, places a safeguard about our homes which cannot be too highly commended. Much of this interest in sanitary appliances and the proper construction of our dwellings we owe to the press, and the earnest manner in which it has always endeavored to coöperate with our Board demands the unqualified thanks which we are now pleased to offer it.

#### CONCLUSION.

In concluding this report, as the executive officer of the Board I desire to acknowledge with thanks my personal obligations for the counsel and assistance that has been rendered me by every member of the Board. Our relations have been most pleasant and entirely harmonious in our mutual coöperation to advance the sanitary interest of the State; and if the Legislature in its wisdom will endow this Board of Health with sufficient legal power to preserve the State from the ravages of disease, and enable it to adopt the suggestions embodied in this report, we are convinced that the Board as now constituted is fully qualified to carry out successfully the provisions of the desired law, and place our commonwealth in an advanced position, not only in the conservation of life and the repelling of disease, but in all those appliances of modern sanitary science which are of benefit to the human family from the very beginning of life to its end, and thereby

as a consequence lessening the tendency to sickness, disease, and death, and increasing the health, happiness, and material prosperity of our people. We believe our Board to be now in a position to fulfill all its promises if intrusted with the needful power to make its administration a success. We look to the patriotism and good sense of our lawgivers to see that the legal means shall not be denied, but that we shall have ample power to add to the grandeur of this favored State by increasing its public wealth in giving it public health.

Appended to this report is the account of the expenditure of the Board for the past two years, vouchers for which are on file in the Controller's office.

I likewise present the report of the State Analyst, with a general statement of the needs of the office and the work which he was enabled to do.

Appended to this report will also be found the names of our correspondents, which will illustrate the various regions of the State from which we derive our information.

The reports of the several hospitals are also presented, but not, we regret to say, in that complete form which should be characteristic of hospital statistics. Indeed, many of the county hospitals have failed to make any return, probably from the loose manner in which their affairs are managed.

The mortuary tables accompanying this report are prepared and tabulated from the returns received from our correspondents, and although they do not represent the total deaths of the State, they convey a fair idea of the causation and average death rate.

All of which is respectfully submitted.

GERRARD G. TYRRELL, M.D.,  
Permanent Secretary California State Board of Health.

## REPORT OF THE STATE ANALYST.

### GENERAL STATEMENT.

The creation of the office of State Analyst by the Legislature at its last general session was an official recognition of a need already widely felt. The individual is powerless to protect himself against the adulterations and frauds which may be perpetrated in the manufacture and preparation of foods, wines, medicines, etc. It is a legitimate and well recognized function of the State to protect its citizens against such frauds and impositions. Thorough investigations in the interests of the public are needed to hold such impositions in check, as well as to furnish the necessary legal evidence for the conviction of the guilty.

The pressing necessity for such chemical examinations, although largely a matter of quite recent date, has been felt and recognized in all civilized countries. The municipal laboratory of Paris may serve as a well known illustration. It had its origin as an annex to the institution for the tasting and testing of wines, but in 1878 it was opened on the broader foundation of an institution for the investigation of suspected adulterations of foods, drugs, wines, etc. In 1881 a new laboratory building, specially constructed and equipped for its use, was opened to it. Its advantages are open to any one within the city, so that for a nominal expense any one can have suspected food, drugs, wine, etc., examined. State Analysts have been maintained for a number of years in the several districts of Great Britain. Similar provisions have also been made in Germany, Austria, and other countries on the continent of Europe. Many of the Eastern States have created the office of State Analyst or State Chemist, or made provision for carrying on investigations of suspected adulterations, etc.

The Act creating the office of State Analyst has a twofold object: 1, to protect the public against frauds and adulterations of foods, wines, drugs, etc.; 2, to give practical information in regard to certain resources of the State, and by implication to render all possible service in the material development of the commonwealth. Under this second head are specially mentioned the investigation of the mineral waters, medicinal plants, minerals, etc., of the State. The value to the State and the general public of a thorough and systematic analysis of the mineral waters within the boundaries of the State cannot well be overestimated. The physicians of the State individually and in their various societies, county and State, ask for it most urgently. This request—and I had almost said demand—of so large and honorable a body of men, cannot safely be disregarded or deferred. They ask it as guardians of the public and solely in the interest of the public. It is confidently believed that the slight expense which these analyses would involve, would be returned to the State a hundred-fold. We would find at home what is now sought abroad, but at an enormous expense; we would bring hundreds of visitors to our coast and build up many of the waste places of the State. If precedent were needed we can find it in the well settled policy of Germany. For generations the Professors of Chemistry in the various universities of Germany have been charged with the analysis of the mineral waters in their particular Duchy or Kingdom.

The Government has expected at their hands a most careful and thorough investigation; and as a result of this policy, continued through a long series of years, the springs of Germany and their characteristic properties are better known than any others upon the face of the earth. Equally favorable results may be expected here in California when once this system has been thoroughly and successfully in operation. The investigation of the medicinal plants, minerals, etc., of the State, as prescribed by the statute creating the office of State Analyst, is of great importance. This is so apparent to every one that no general discussion of the subject is called for in this place.

To the duties already prescribed might well be added that of examining the burning oils sold within the State. This is a part of the duties of public Analyst in other States and countries. I have collected from the Fire Marshal of San Francisco the following statistics, showing the number and the damages caused by fires having their origin in the explosions of coal oil lamps:

From.	To.	Explosions of Coal Oil Lamps.	Loss.
July 1, 1864 .....	June 30, 1874 .....	28	\$12,709 60
July 1, 1874 .....	June 30, 1875 .....	9	567 00
July 1, 1875 .....	June 30, 1876 .....	16	8,499 00
July 1, 1876 .....	June 30, 1877 .....	18	16,827 60
July 1, 1877 .....	June 30, 1878 .....	27	6,206 62
July 1, 1878 .....	June 30, 1879 .....	29	9,834 50
July 1, 1879 .....	June 30, 1880 .....	34	47,906 87
July 1, 1880 .....	June 30, 1881 .....	29	58,735 72
July 1, 1881 .....	June 30, 1882 .....	33	51,235 00
July 1, 1882 .....	June 30, 1883 .....	35	25,424 71
July 1, 1883 .....	June 30, 1884 .....	33	6,875 48
July 1, 1884 .....	June 30, 1885 .....	17	29,344 29
July 1, 1885 .....	February, 1886 .....	17	5,456 10
Totals .....	.....	.....	\$273,622 49

We find that the reported loss by fire caused by the explosion alone of coal oil lamps in the City of San Francisco, from July, 1864, to February, 1886, amounted to \$273,622 49. A glance at the table will also show that the loss has increased very rapidly within a few years. From July 1, 1879, to June 30, 1885, six years, the loss amounts to \$219,522 07. It is fair to suppose that these explosions were caused either from the use of unsafe oil or from bad lamps, but probably the fault is to be found in the oil. Comment is unnecessary.

#### THE ANALYSIS OF POTABLE WATER.

Before giving the results obtained in the examination of drinking water, I wish to discuss very briefly the subject of water examination for sanitary purposes. The investigation of potable water presents far greater difficulties than the general public know or think. When we reflect, however, how little is definitely known of the actual cause of many diseases, we can then begin to appreciate the difficulty or impossibility of detecting that unknown cause in water. The history of the various methods proposed for the examination of drinking water shows that these methods have changed with the theories of the causes of disease. The earlier methods were purely chemical, and a chemical analysis was all that was attempted. Let us for a moment consider what a chemical analysis may fairly be expected to

accomplish. By it we come to a pretty accurate knowledge of the inorganic constituents of the water. Now this may be of importance, yet it is not as a rule vital. An excess of mineral matter is usually easily recognized even by an ordinary person, and it will be a thing of rare occurrence in the case of river or lake water supplied to cities and towns, that these inorganic constituents are objectionable or injurious. The organic material we have believed to contain, or was itself, this injurious thing in the water. It is impossible to identify this organic matter with anything like the certainty that we do the inorganic matter. Organic matter undergoes so many transformations, and so rapidly, that we cannot follow them, or at best only with the greatest difficulty, and very imperfectly. As a simple matter of fact, chemists have not attempted to separate the organic matter which may exist in water into the various compounds which it may contain, and then recognize and identify these separate compounds. This is an impossibility. The most that we have dared to hope for, has been to get some general hints and indications as to the nature of this organic matter. The various methods employed by different chemists have this general aim.

The assumption or presumption is, that all matter of animal origin is bad, or sure to become so very quickly; vegetable matter may be, or may become objectionable. Above all things, the excreta of the animal body, especially when diseased, the secretions of diseased organs, these are bad, and only bad. Why these secretions have been so injurious, has not always been so easily explained. Prof. Mallet,\* in his investigation of potable water, undertaken for the National Board of Health, calls attention to the fact that no known poison can produce, in the diluted state, the effects which can be traced to a drinking water contaminated with human excreta. In short, there seems to be no dilution which can make such polluted waters safe. This is an accepted doctrine of hygiene. The chemical methods used to give some indication as to the character of a water, *i. e.*, the organic matter contained in the water, may be classed as follows:

- I. The treatment with permanganate of potash.
- II. The combustion method (involving an organic analysis).
- III. The albuminoid ammonia process.

In addition, a determination of the nitrates and nitrites is called for; the free oxygen, ammonia, chlorine, suspended matters, the amount of mineral matter, etc., should be determined in an examination of potable water. When, by the use of the most accurate chemical methods, we have accomplished all this, we have, at the very most, only a suggestion as to the character of the water. It is possible that the indications obtained by the chemical examination may be in every respect satisfactory, and yet the water may be dangerous. Prof. Frankland,† in a discussion of the subject of potable water, quotes the classical investigation of Dr. Hägler, of Basel, in which is shown that the pure mountain water was contaminated with the secretions of a single typhoid fever patient; and, as this water was the water supply of the village of Lausenne, near Basel, Switzerland, an epidemic of typhoid fever broke out, and was clearly traced to the water of the town. Diluted as those secretions must have been, it is not to be supposed that any chemical examination of the water would have revealed any suspicion in regard to it. The water could not have been convicted upon any chemical testimony.

Pasteur has demonstrated a theory of fermentation, which has been

\* Report of National Board of Health, p. 201.

† Journal of the Chemical Society, 1876; vol. 29, p. 826.

widely extended, and now explains the ordinary phenomena of putrefaction and decay. This same theory, still further extended, accounts for the spread of certain zymotic diseases. This germ theory of disease explains better than any other the communication of disease through the medium of potable water. Now, while the pure water may carry the germ of disease, it is not so likely to nourish and propagate it. On the other hand, the water which chemical tests have shown to be impure, *i. e.*, which contains organic matter in excess, which is putrefying, or very liable to—this is the culture fluid for the germs of disease; this is the explanation why such waters are dangerous.

With this presentation of the results of chemical investigation of waters, it is evident that other methods, and the help of other departments of science, are called for. We naturally turn to biology, and to its methods, in the hope that, with a history of the germ, and a knowledge of its growth and development, we may the better recognize its presence. Professor Koch, of Berlin, has, for the last few years, practiced a method suggested by his bacteriological studies. His method is based upon the culture of the germs in a medium so arranged that the groups or colonies of germs which are developed can be observed and counted. This is a more rational method, if germs are the cause of disease; yet there is very much to be investigated; and, at the very most, we are obliged to draw our conclusions very cautiously, and state them modestly.

The chemical method enables us to say of certain waters containing an excess of easily decomposable matter, that they are bad, or very likely to become so. The biological and bacteriological methods will give still further information in regard to the water, but still we must confess that it will be difficult in many cases to say with certainty this or that water is good, absolutely free from any injurious substance or body. The evidence that we get is more negative than positive. When a water is known to be polluted, this fact outweighs all the negative results of a chemical investigation. The method of Professor Koch applied to the various methods of purifying water, shows that some of these methods are of great value, and that water teeming with germs was practically freed from these waters during certain filtrations, etc. There is a tendency on the part of running water to self purification, and especially when it is filtered through sand, porous rocks, etc.

I have felt called upon to make this preliminary statement in regard to the value of water analysis in general, in order that the results of the analyses here reported may not be misunderstood. The examination has been purely chemical, and all that I dare to claim for them is negative evidence.

Three samples of water were sent to me from the office of the State Board of Health. These were marked Sanborn Wells, Sacramento River, Sacramento River, from hydrant. The following report was returned:

	Sanborn Wells, pts. per 1,000,000.	Sacramento River, pts. per 1,000,000.	Sacramento River, from hydrant, pts. per 1,000,000.
Total amount of solid matter.....	320.00	110.00	-----
Chlorine .....	64.4	6.4	6.3
Free ammonia .....	0.06	0.1	0.05
Albuminoid ammonia.....	0.70	0.1	0.13
Nitrates and nitrites .....	3.02	-----	1.02



Qualitative analysis of the inorganic substances in Sanborn Wells: Alumina, iron, lime, magnesia, potash, soda, hydrochloric, sulphuric, carbonic, and silicic acids. The hardness of Sanborn Wells is considerably greater than the Sacramento River water. The above analysis shows nothing that would indicate that these waters are not suitable for domestic use. No experiments were made with the method of Professor Koch.

Two samples of water were received from Dr. J. S. Baker, Health Officer of Los Angeles, marked I and II.

The examination for free ammonia showed 0.18 parts in 1,000,000 for No. I, and 0.02 for No. II. The albuminoid ammonia was in both cases less than 1.01 parts in 1,000,000.

This test would place both very high so far as organic matter is concerned. The test shows them to be practically the same.

## TOTAL SOLID.

	I. Grains per Gal.	II. Grains per Gal.
Residue .....	28.49	-----
Chlorine .....	0.17	0.17
Nitrites .....	None.	None.
Calcium Carbonate .....	11.6	*
Magnesium Carbonate .....	3.33	*

\* No separate determination was made, as there seemed to be no difference.

The water was clear, without odor, and judged by the result of the chemical analysis, in every way unobjectionable. The hardness would largely disappear upon boiling, or upon the addition of a small amount of lime water.

W. B. RISING,  
State Analyst.

## STATEMENT

*Of the Expenses of State Board of Health for thirty-sixth fiscal year, ending June 30, 1885.*

1884.			
Appropriation.....			\$1,250 00
Aug. 16—Dr. Baldwin, quarantine services at Yuma .....		\$113 85	
Dr. Hatch.....		40 75	
Sept. 12—Dr. Hatch.....		66 87	
Dr. Gibbons, Sr. ....		15 00	
Oct. 10—Dr. Hatch, office rent.....		21 25	
Nov. 19—Office rent.....		21 25	
Dec. 2—Dr. Orme, traveling expenses.....		50 00	
Dr. Crowder, traveling expenses.....		8 00	
Dr. Briceland, traveling expenses.....		22 00	
1885.			
Jan. 7—Postal cards.....		10 00	
Postage, stamps, and express.....		48 23	
Post Office rent.....		2 00	
15—Traveling expenses of members.....		107 00	
Feb. 7—Stamps, rent.....		30 00	
Mar. 1—Postage, etc.....		12 85	
20—Stamps, postage, etc.....		40 00	
27—Sanitarian and rent.....		29 00	
April 16—Traveling expenses.....		20 00	
18—Traveling expenses of members.....		12 00	
Traveling expenses of members.....		50 00	
22—Expressage.....		89	
29—Rent, stamps, and expressage.....		30 35	
May 12—Expressage circulars.....		12 30	
Postal cards and stamps.....		20 00	
29—Rent and expressage.....		25 85	
June 15—Postal cards.....		5 00	
19—Cabinet from late Dr. Hatch.....		40 00	
22—American Health Association.....		32 40	
Office rent.....		25 00	
Total.....		\$911 84	
Balance.....		388 16	
Total.....		\$1,250 00	\$1,250 00

## STATEMENT

*Of the Expenses of State Board of Health for thirty-seventh fiscal year, ending June 30, 1886.*

1885.			
Appropriation .....			\$1,250 00
July	1—Post Office rent .....	\$2 00	
	15—Postage stamps .....	5 00	
	16—Telegraph .....	2 20	
	20—Express .....	50	
	31—Sanitary News .....	2 00	
	Traveling expenses members of Board .....	104 00	
	Rent of office .....	25 00	
Aug.	26—Stamps and rent .....	30 00	
Sept.	4—Seven copies of Sanitary Engineer .....	28 00	
	20—Postal cards .....	20 00	
	Office rent and Post Office .....	27 00	
Oct.	12—Postage stamps .....	5 00	
	Traveling expenses of members .....	92 00	
	19—Postage stamps .....	5 00	
	24—Postage stamps .....	14 00	
	27—Postage stamps .....	5 00	
	30—Rent .....	25 00	
Nov.	30—Rent .....	25 00	
Dec.	11—Stamps .....	5 00	
	Post Office rent .....	2 00	
	Office rent .....	25 00	
1886.			
Jan.	12—Traveling expenses of members .....	104 00	
	14—American Health Association .....	25 15	
	American Health Association, Vol. XI .....	5 00	
	15—Postage stamps .....	10 25	
	31—Office rent .....	25 00	
Feb.	10—Postage stamps .....	10 00	
	Sanitarian .....	4 00	
	Postage .....	3 97	
	28—Rent .....	25 00	
Mar.	12—Stamps .....	5 00	
	31—Post Office rent and office .....	27 00	
April	15—Directory holder .....	2 50	
	19—Traveling expenses of members .....	147 00	
	29—Expressage and stamps .....	15 35	
	Statistician .....	4 00	
	30—Office rent .....	25 00	
May	2—Prize essays .....	8 00	
	4—Telegrams .....	2 20	
	5—Traveling expenses .....	25 00	
	29—Postal cards and stamps .....	20 00	
	31—Rent .....	25 00	
June	19—Stamps .....	10 00	
	Rent .....	25 00	
Total .....		\$1,002 12	
Unexpended .....		247 88	
Total .....		\$1,250 00	\$1,250 00

# NAMES AND RESIDENCES OF CORRESPONDENTS

*Of the State Board of Health for the year ending June 30, 1886.*

---

Dr. J. E. S. BAKER.....	Angels Camp, Calaveras County.
Dr. S. C. GIBSON.....	Anderson, Shasta County.
Dr. E. C. RHODES.....	Arbuckle, Colusa County.
Dr. R. F. ROONEY.....	Auburn, Placer County.
Dr. SAMUEL McCURDY.....	Azusa, Los Angeles County.
Dr. T. H. MAYON.....	Amador City, Amador County.
Dr. A. FOUCH.....	Anderson, Shasta County.
Dr. J. H. BULLARD.....	Anaheim, Los Angeles County.
Dr. J. M. VANCE.....	America, Santa Clara County.
Dr. J. M. FORREST.....	Alturas, Modoc County.
Dr. C. H. GIBBONS.....	Arbuckle, Colusa County.
Dr. C. A. ROGERS.....	Bakersfield, Kern County.
Dr. V. NEWMARK.....	Benicia, Solano County.
Dr. F. H. PAYNE.....	Berkeley, Alameda County.
Dr. O. C. HAWKINS.....	Biggs Station, Butte County.
Dr. D. WALKER.....	Bodie, Mono County.
Dr. J. H. JOHNSON.....	Calico, San Bernardino County.
Dr. C. C. MASON.....	Chico, Butte County.
Dr. M. F. PRICE.....	Colton, San Bernardino County.
Dr. J. O. SMITH.....	Cottonwood, Shasta County.
Dr. J. PARKER.....	Castroville, Monterey County.
Dr. W. A. PATTERSON.....	Cedarville, Modoc County.
Dr. R. S. MARKELL.....	Cloverdale, Sonoma County.
Dr. A. M. GARDNER.....	Calistoga, Napa County.
Dr. H. N. MINER.....	Colfax, Placer County.
Dr. G. F. MASON.....	Cloverdale, Sonoma County.
Dr. E. J. R. DE TURBEVILLE.....	Camptonville, Yuba County.
Dr. A. TRAFTON.....	Dixon, Solano County.
Dr. ALEMNY JUMP.....	Downieville, Sierra County.
Dr. A. C. COLLINS.....	Davisville, Yolo County.
Dr. E. W. BATHURST.....	Etna Mills, Siskiyou County.
Dr. J. A. MCKEE.....	Elk Grove, Sacramento County.
Dr. N. S. GIBERSON.....	Eureka, Humboldt County.
Dr. D. E. BARGER.....	El Paso de Robles, San Luis Obispo County.
Dr. PAUL REUDY.....	Forest Hill, Placer County.
Dr. G. M. KOBER, U. S. A.....	Fort Bidwell, Modoc County.
Dr. F. DURANT.....	Folsom, Sacramento County.
Dr. A. J. PEDLAR.....	Fresno, Fresno County.
Dr. M. M. ROWLEY.....	Fall River, Shasta County.
Dr. T. V. GOODSPEED.....	Galt, Sacramento County.
Dr. W. C. JONES.....	Grass Valley, Nevada County.
Dr. C. A. E. HERTEL.....	Gonzales, Monterey County.
Dr. J. R. TODD.....	Gridley, Butte County.
Dr. J. G. COOPER.....	Haywards, Alameda County.
DRS. C. F. MILLER and H. V. ARMISTEAD.....	Hill's Ferry, Stanislaus County.
Dr. J. A. DAVIDSON.....	Hanford, Tulare County.
Dr. N. B. COFFMAN.....	Healdsburg, Sonoma County.
Dr. E. G. CAMPLIN.....	Hollister, San Benito County.
Dr. H. SCHAEFFER.....	Igo, Shasta County.
Dr. A. L. ADAMS.....	Ione, Amador County.
Dr. J. N. M. MCGOWAN.....	Jolon, Monterey County.
Dr. E. B. ROBERTSON.....	Jackson, Amador County.
Dr. J. H. LOWE.....	Knights Ferry, Stanislaus County.
Dr. H. S. TAYLOR.....	Livermore, Alameda County.
Dr. J. S. BAKER.....	Los Angeles, Los Angeles County.
Dr. J. FLINT.....	Lincoln, Placer County.
Dr. D. W. WHITE.....	Lakeport, Lake County.
Dr. L. M. LOVELACE.....	Lemoore, Tulare County.
Dr. F. W. COLMAN.....	Lodi, San Joaquin County.
Dr. F. W. KNOWLES.....	Los Gatos, Santa Clara County.
Dr. DAVID POWELL.....	Marysville, Yuba County.
DRS. E. S. O'BRIEN and H. N. RUCKER.....	Merced, Merced County.

DR. J. N. CRABH	Millville, Shasta County.
DR. C. W. EVANS	Modesto, Stanislaus County.
DR. F. R. BROWN	Madera, Fresno County.
DR. W. S. KEARNEY	Mariposa, Mariposa County.
DR. W. E. ROBE	Maxwell, Colusa County.
DR. J. LEFFLER	Martinez, Contra Costa County.
DR. A. WESTFALL	Monterey, Monterey County.
DR. M. B. POND	Napa, Napa County.
DR. H. S. WELCH	Nevada City, Nevada County.
DR. M. SCHNABEL	Newcastle, Placer County.
DR. Z. T. MAGILL	Nicolaus, Sutter County.
DR. G. S. FARLEY	North San Juan, Nevada County.
DR. F. NELSON	Nordhoff, Ventura County.
DR. E. W. BUCK	Oakland, Alameda County.
DR. J. H. M. KARSNER	Oroville, Butte County.
DR. E. CHAFFY	Ontario, San Bernardino County.
DR. C. R. CASTLE	Point Arena, Mendocino County.
DR. J. H. CRANE	Petaluma, Sonoma County.
DR. L. H. PATTY	Petaluma, Sonoma County.
DR. J. L. DRYER	Placerville, El Dorado County.
DR. A. C. SMITH	Plymouth, Amador County.
DR. C. W. BROWN	Pomona, Los Angeles County.
DR. J. H. MILLER	Redding, Shasta County.
DR. A. W. GAMBLE	Redwood City, San Mateo County.
DR. H. E. STAFFORD	Rocklin, Placer County.
DR. JOHN FIFE	Red Bluff, Tehama County.
DR. JACOB ALLEN	Riverside, San Bernardino County.
DR. W. BOLTON	Roseville, Placer County.
BOARD OF HEALTH	Sacramento, Sacramento County.
DR. J. L. MEARES	San Francisco, San Francisco County.
DR. T. L. MAGEE	San Diego, San Diego County.
DR. G. W. COFFIN	Santa Barbara, Santa Barbara County.
DR. C. L. ANDERSON	Santa Cruz, Santa Cruz County.
DR. W. S. THORNE	San Jose, Santa Clara County.
DR. R. P. SMITH, JR.	Santa Rosa, Sonoma County.
DR. D. H. KETCHAM	Santa Maria, Santa Barbara County.
DR. FRED. HUTCHINS	Sierra City, Sierra County.
DR. W. J. G. DAWSON	St. Helena, Napa County.
DR. G. W. SEIFERT	Santa Clara, Santa Clara County.
DR. J. M. BRICELAND	Shasta, Shasta County.
DR. T. R. GOODSPEED	San Mateo, San Mateo County.
DR. W. D. GROTON	Susanville, Lassen County.
DR. H. J. CRUMPTON	Sausalito, Marin County.
DR. J. A. CRANE	Santa Ana, Santa Barbara County.
DR. E. E. BROWN	Selma, Fresno County.
DR. MAY GYDISON	Salinas City, Monterey County.
DR. S. G. HUFF	San Bernardino, San Bernardino County.
DR. W. W. HAYES	San Luis Obispo, San Luis Obispo County.
DR. T. PHILLIPS and DR. A. T. HUDSON	Stockton, San Joaquin County.
DR. WM. CURLESS	Truckee, Nevada County.
DR. H. P. TARTAR	Tehama, Tehama County.
DR. R. G. REYNOLDS	Upper Lake, Lake County.
DRS. KING and HOGSHEAD	Ukiah, Mendocino County.
DR. W. F. LYNCH	Volcano, Amador County.
DR. JAMES FROST and DR. W. D. ANDERSON	Vallejo, Solano County.
DR. T. W. PENDERGRASS	Visalia, Tulare County.
DR. A. J. COMSTOCK	Ventura, Ventura County.
DR. J. C. MONTAGUE	Weaverville, Trinity County.
DR. W. D. RODGERS	Watsonville, Santa Cruz County.
DR. THOS. ROSS	Woodland, Yolo County.
DR. H. C. CROWDER	Williams, Colusa County.
DRS. OVEREND and MELTON	Wheatland, Yuba County.
DR. D. N. MASON	Willits, Mendocino County.
DR. J. H. WESSCHER	Yuba City, Sutter County.

## HOSPITALS.

The following reports have been received from some of the county hospitals in the State. It is to be regretted that all the county hospitals are not represented, as the omission of any county mars the completeness of the record. It seems, however, that the records of some of our county hospitals are kept in such a careless and unsatisfactory manner that when a request is made for reliable data they are unable to supply it; hence the diseases and deaths of the indigent sick in these counties is unknown:

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Trinity County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
12	Accident, fracture of spine.....	12	-----	Pneumonia .....	1
21	Old age .....	21	-----		

Number of months reported .....	12	Died .....	5
Total on hand at commencement of year ..	7	Percentage of deaths .....	4.6
Total admitted .....	16	Remaining under treatment .....	5
Discharged cured .....	13		

The aged and infirm, as well as the indigent sick of the county, are maintained in the county hospital or infirmary. The building is located on elevated ground; good air, good ventilation, good drainage, and good water; unlimited space to each patient; the best supplies to be had; the best available medical attendance.

*Name and location of hospital:* COUNTY HOSPITAL, Weaverville, Trinity County, California.  
*Physician's name and Post Office address:* J. C. MONTAGUE, M.D., Weaverville, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Santa Clara County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
---	Suicide .....	1	---	Hemorrhage of stomach .....	1
---	Phthisis .....	15	---	Heart disease .....	4
---	Paralysis .....	10	---	General debility .....	2
---	Softening of brain .....	1	---	Goitre .....	1

Number of months reported .....	12	Discharged .....	218
Total on hand at commencement of year ..	86	Died .....	35
Total admitted .....	233	Percentage of deaths .....	9 1/2
Discharged cured .....	120	Remaining under treatment .....	66

*Name and location of hospital:* SANTA CLARA COUNTY INFIRMARY, near San José, California.  
*Physician's name and Post Office address:* J. L. BERRY, M.D., San José, Santa Clara County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Joaquin County Hospital for the year ending December 31, 1884.*

Total by each Disease.	DISEASES.	No. Deaths by each Disease.	Total by each Disease.	DISEASES.	No. Deaths by each Disease.
6	Granulated eyelids.....	.....	3	Parturition.....	.....
60	Rheumatism.....	.....	7	Bubo.....	.....
4	Biliousness.....	.....	12	Broken arms.....	.....
14	Senility.....	.....	12	Apoplexy.....	.....
4	Blind.....	.....	1	Kicked by horse.....	.....
8	Secondary syphilis.....	.....	1	White swelling.....	1
14	General debility.....	6	4	Injury to side.....	.....
10	Ague.....	.....	21	Debility.....	.....
4	Dropsy.....	1	1	Injured arm.....	.....
1	Lumbago.....	.....	2	Orchitis.....	.....
16	Pneumonia.....	2	1	St. Vitus' dance.....	.....
18	Ulcerated legs.....	.....	3	Injury to head.....	.....
10	Cripples.....	.....	1	Mumps.....	.....
2	Syphilitic rheumatism.....	.....	1	Tumor on face.....	.....
1	Rupture of bowels.....	.....	2	Sprained shoulder.....	.....
3	Fracture of hip.....	.....	2	Hemorrhage.....	.....
7	Sciatic rheumatism.....	.....	3	Broken shoulder.....	.....
4	Bronchitis.....	.....	4	Injured hands.....	.....
1	Urinary fistula.....	.....	1	Burned wrist.....	.....
21	Paralysis.....	4	1	Measles.....	.....
11	Syphilis.....	1	1	Inflammatory rheumatism.....	.....
17	Consumption.....	9	4	Indigent.....	.....
2	Dog bites.....	.....	1	Swelled testicles.....	.....
3	Sprained ankles.....	.....	4	Asthma.....	.....
1	Neuralgia.....	.....	2	Hemorrhoids.....	.....
10	Gonorrhœa.....	.....	4	Lunacy.....	.....
1	Gangrene foot.....	.....	2	Broken legs.....	.....
2	Typhoid fever.....	.....	1	Abscess on arm.....	.....
9	Lung trouble.....	.....	1	Idiot.....	.....
3	Hernia.....	.....	1	Internal injury.....	.....
8	Strictures.....	.....	1	Poison.....	.....
14	Alcoholism.....	2	1	Sunstroke.....	.....
2	Intermittent fever.....	.....	1	Sore finger.....	.....
7	Injury to feet.....	.....	1	Sore throat.....	.....
1	Congestion of the lungs.....	1	5	Remittent fever.....	.....
2	Cut on hand and chin.....	.....	1	Sore ankle.....	.....
1	Cut on back.....	.....	2	Diarrhœa.....	2
2	Erysipelas.....	.....	1	Cut on knee.....	.....
5	Cystitis.....	1	1	Injured spine.....	.....
1	Fractured cranium.....	1	1	Injured leg.....	.....
2	Broken ankles.....	.....	1	Canker mouth.....	.....
1	Influenza.....	.....	1	Tapeworm.....	.....
1	Injury to head and back.....	.....	1	Abscess.....	.....

Number of months.....	12	Discharged.....	288
Total on hand at commencement of year.....	80	Died.....	31
Total admitted.....	336	Percentage of deaths.....	7.46
Discharged cured.....	203	Remaining under treatment.....	97

Name and location of hospital: SAN JOAQUIN COUNTY HOSPITAL, Stockton, California.

Physician's name and Post Office address: W. A. WASHINGTON, M.D., County Physician, Stockton, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Los Angeles Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
1	Blind	—	1	Tumor	—
14	Paralysis	—	1	Lead poison	—
43	Rheumatism	2	1	Abscess	—
40	Phthisis	10	2	St. Vitus' dance	—
12	Asthma	1	3	Rupture	—
11	Fractures	—	1	Diarrhœa	1
1	Gout	—	2	Heart disease	—
6	Dropsy	5	3	Neuralgia	—
4	Wounds	1	2	Epilepsy	—
23	Fevers	1	4	Erysipelas	—
8	Ulcers	—	1	Skin disease	—
2	Sores	—	3	Hemorrhages	—
19	Bruises	2	1	Sore feet	—
1	Lumbago	—	6	Sore eyes	—
1	Piles	—	1	Sore ears	—
7	Old age	2	2	Liver complaint	—
2	Fistula	—	1	Measles	—
1	Syphilis	—	11	General debility	2
2	Dislocations	—	4	Paupers	—
4	Bronchitis	—	12	Colds	—
2	Malaria	—	1	Lame	—
1	Poisoned	—	1	Bright's disease	—
2	Confinement	—	1	Weak mind	—
1	Hysteria	1	2	Delirium tremens	—
1	Nervous disease	—	89	Not named	10
4	Dysentery	1	1	Sore hand	—
2	Sprains	—			

Number of months reported	12	Discharged	269
Total on hand at commencement of year	42	Died	40
Discharged cured	No record.	Percentage of deaths	94
Total admitted	373	Remaining under treatment	54

Los Angeles County Hospital and Farm is situated in Los Angeles County, about one mile east of the city, on a farm of thirty-seven acres of rolling ground; is high and dry, with a fine view of the city and surrounding country. The hospital is surrounded by a fine orchard of orange, lemon, apple, peach, fig, and other fruit trees. The front is nicely laid out in flowers, and each side of the entrance road is bordered with cypress hedges, as is the front on both sides of the entrance. Along the sides and back are numerous pepper trees, for shade. The hospital is a large fine building of wood, two stories high, each twelve feet in clear, hard finished throughout, is set up about five feet from the ground, with wide porches around the front of building, and a wide porch above and below in the rear; containing seven large wards in the main building and two sunny wards in the rear, which are used for consumptive patients; each with nine or ten beds, each lighted with nine large windows. Both wards stand up ten feet above the ground; under one is the laundry fitted up with stationary tubs and hot and cold water. The seven large wards in the main building have room for ten to twelve beds in each. Two of the wards on the south each have five large windows; the two on the east and west front each have four windows. The main hallway is twelve feet wide; cross halls between the wards are ten feet wide. There are water-closets and bath-rooms on each floor. The front is occupied as office, dispensary, and storeroom, on one side of the hall; the other is occupied as reception-room and library. The second floor has three of the large wards and four smaller rooms that are occupied by the steward, matron, and nurses. In the rear of the main building, between the two wards in the rear, is the dining-room, seating at present fifty-four; under the dining-room is the kitchen, fitted up with range and hot-water tank, also storeroom and dining-room for employes. The house is supplied with water from the city water-works. The sewerage is good, having a fall of about fifty feet, to a ravine with running water in, in the rear of the farm. Supplies are bought in Los Angeles as needed. Dr. Walter Lindley is medical attendant—visits every day. The house was built in 1878, and is now in good condition. The area to each patient I do not know.

WALTER LINDLEY, M.D.

Dr. Lindley took charge of the hospital January 8, 1885.

*Name and Location of hospital:* HOSPITAL AND POOR FARM, Los Angeles County, California.  
*Physician's name and Post Office address:* WALTER LINDLEY, Los Angeles, California.



## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Nevada County Hospital for the year ending January 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
10	Paralysis .....	1	2	Gastritis .....	
12	Syphilis .....		1	Scald .....	
12	Rheumatism, chronic .....		4	Pneumonia .....	1
21	Rheumatism, acute .....		1	Meningitis .....	1
6	Blind .....		2	Cancer .....	1
2	Ophthalmia .....		1	Heart, valvular disease of .....	
12	Softening brain .....	1	1	Dementia .....	
4	Concussion brain .....		1	Hæmoptysis .....	1
1	Diabetes .....		1	Hæmorrhoids .....	
8	Delirium tremens .....		2	Anaurosis .....	
3	Asthma .....		1	Dislocation, shoulder .....	
12	Epilepsy .....	1	3	Sprain, ankle .....	
1	Brônchitis .....	1	2	Fracture, compound .....	
1	Tuberculosis .....		3	Fracture .....	
1	Phthisis .....		3	Wounds .....	
3	Cystitis .....		1	Old age .....	1
1	Bilious fever .....		3	Unknown .....	
3	Intermittent fever .....		30	Indigent poor .....	
1	Alcoholism .....	1	1	Stricture, urethra .....	
Number of months reported .....		12	Died .....		10
Total admitted .....		163	Percentage of deaths .....		6.13
Discharged cured .....		33	Remaining under treatment .....		65
Discharged .....		55			

*Name and location of hospital:* NEVADA COUNTY HOSPITAL, Nevada City, California.*Physician's name and Post Office address:* Dr. R. W. HUNT, Nevada City, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Benito County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
1	Asthma .....		1	Chronic syphilis .....	
12	Acute rheumatism .....		1	Accident .....	
1	Pneumonia .....		1	Accident—injury to head .....	
Number of months reported .....		12	Discharged .....		1
Total on hand at commencement of year .....		4	Died .....		None.
Total admitted .....		10	Percentage of deaths .....		None.
Discharged cured .....		11	Remaining under treatment .....		2

Located on San Benito Street, in the corporation, just below the business portion of the town. Ventilation good; clean, airy rooms; sewerage good.

*Name and location of hospital:* COUNTY HOSPITAL, San Benito County, California.*Physician's name and Post Office address:* E. G. CAMPLIN, M.D., Hollister, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Mendocino County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
2	Aneurism aorta.....	1	2	Typhoid .....	---
3	Paralysis .....	1	3	Fractures .....	---
1	Tetanus .....	1	1	Cataract .....	---
6	Phthisis .....	2	2	Gonorrhœa .....	---
3	Cancer .....	2	8	Rheumatism—simple .....	---
4	Syphilis .....	---	4	Rheumatism—inflammatory.....	---
3	Pneumonia .....	---	5	Bronchitis .....	---
1	Inflammation of bowels.....	1	1	Indigent and old age.....	---
2	Malarial intermittent .....	---	7		

Location of hospital is on high gravelly land; no sewerage, but good natural drainage. Ventilation good; supplies excellent; no resident physician; one visiting physician, who is Superintendent of hospital and farm. The plan of the hospital is exactly that of the Sacramento hospital. Only one ward built and used during 1884. This ward is now three years old. Two additional wards have been built this year, 1885. Water is supplied from well and tank. An average of eighteen inmates in hospital, which gives ninety square feet to each patient, surface area.

*Name and location of hospital:* MENDOCINO COUNTY HOSPITAL, Ukiah City, California.

*Physician's name and Post Office address:* BARTON DOZIER, M.D., Ukiah City, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Contra Costa Hospital for the year ending January 1, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
10	Phthisis pulmonalis .....	7*	26	Syphilis.....	---
5	Bright's disease.....	2*	15	Malaria .....	---
48	Rheumatism .....	---			

\*The remaining three were taken care of by friends, and died outside of hospital.

Number of months reported.....	12	Discharged .....	89
Total on hand at commencement of year.	15	Died .....	9
Total admitted .....	101	Percentage of deaths .....	0.6
Discharged cured.....Can not now ascertain.		Remaining under treatment.....	18

A comparatively large number have been marked "marasmus senilis," this institution being almshouse as well as hospital.

This hospital is located within the town limits, on the slope of a beautiful hill, with a fine view of Alhambra Valley and of Suisun Bay. It is protected from the west winds by a still higher hill. It consists of three buildings—one for the men, one ostensibly for the women, but generally used for cases whom it is desirable to isolate. The middle building serves as a dining-room and kitchen. The sewerage water is utilized for irrigating about four acres of fruit trees, grapevines, and vegetables. Ventilation is perfect. Medical attendance daily. Supplies are contracted for and furnished by the merchants of the town, and taken care of by the medical attendant, who is at the same time general superintendent. Plenty surface area to each patient; can not now ascertain the number of square feet. Good water, and enough of it for cooking, bathing, and irrigating purposes, supplied by a windmill. The place has been occupied for three years, and I think it compares favorably with any hospital of its size in this State that I have seen.

*Name and location of hospital:* CONTRA COSTA HOSPITAL, Martinez.

*Physician's name and Post Office address:* H. BERNETT, M.D., Martinez, Contra Costa County.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Napa County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
4	Rheumatism .....	1	1	Renal colic .....	
3	Bronchitis .....	3	3	Diarrhoea .....	
1	Delirium tremens .....	1	1	Poison oak .....	
1	Panama fever .....	12	12	Lumbago .....	
5	Intermittent fever .....	12	12	Chronic ulcer .....	
1	Paralysis .....	1	1	Fistula in ano and syphilis .....	1
4	Phthisis pulmonalis .....	4	55	Indigent, with slight illness, or injury, or left while under treatment .....	
1	Sciatica .....				
12	Influenza .....	12			
12	Aneurism aorta .....	12			

Number of months reported .....	12	Discharged .....	55
Total on hand at commencement of year .....	26	Died .....	7
Total admitted .....	82	Percentage of deaths .....	7.56
Discharged cured .....	27	Remaining under treatment .....	19

NOTE.—The percentage is of all under my care during the year, whether treated or not, no account having been kept of those included in the last item (55).

The hospital is a frame building, located about a mile and a half from Napa City. It is very well ventilated, and the sewerage is ample. The physician receives a salary, and visits the hospital when necessary. Plenty of good well water, and about five acres of land under cultivation.

*Name and location of hospital:* NAPA COUNTY INFIRMARY, Napa City, California.

*Physician's name and Post Office address:* E. HAUN, M.D., Napa City, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Shasta County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
10	Phthisis pulmonalis .....	4	3	Hæmatemesis .....	1
3	Nephritis (chronic) .....	2	2	Hemorrhoids .....	
4	Cancer .....	4	1	Asthma .....	
4	Alcoholism .....	1	1	Fracture leg, compound (blood poison) .....	1
5	Cirrhosis .....	2	3	Eczema .....	
2	Paralysis .....	1	5	Hepatitis .....	
12	Dysentery (chronic) .....	1	5	Wounds of foot (ax) .....	
12	Amaurosis .....		1	Constipation .....	
3	Chronic ulcers (leg) .....		1	Measles .....	
1	Cataract .....		1	Fracture femur .....	
12	Rheumatism .....		1	Congestion brain .....	1
1	Vertigo .....		2	Cystitis .....	
1	Ataxia (leg) .....	1	1	Orchitis .....	
3	Meningitis (chronic) .....	1	1	Dislocation shoulder .....	
3	Debility (old age) .....		1	Hernia .....	
4	Conjunctivitis .....		1	Varicose veins .....	
15	Malarial fever .....		1	Pneumonia .....	1
2	Abscess (in. max.) .....				

Number of months reported .....	12	Discharged .....	16
Total on hand at commencement of year .....	27	Died .....	16
Total admitted .....	106	Percentage of deaths .....	12
Discharged cured .....	58	Remaining under treatment .....	37

Shasta County Hospital is located three quarters of a mile from the Town of Shasta, the county seat of Shasta County. There are six separate buildings, five of which are for accommodation of patients, one for Steward and family. Drainage excellent. Water supply ample. Forty patients can be comfortably accommodated. One Physician and one Steward. Institution sustained by tax of \$2 per capita.

*Name and location of hospital:* SHASTA COUNTY HOSPITAL, Shasta County, California.  
*Physician's name and Post Office address:* J. M. BRICELAND, M.D., Shasta, California.

### REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Los Angeles County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
5	Alcoholism .....		1	Hair lip .....	
7	Blind .....		1	Inflammation of bowels .....	4
12	Brain disease .....		3	Liver complaint (hepatitis) .....	
3	Burn .....		4	Necrosis .....	
8	Bowel complaint .....		6	Nervous disease .....	1
1	Cancer .....		11	Kidney disease (Bright's) .....	1
11	Cold .....	26	2	Paralysis .....	6
4	Confinement .....		2	Piles .....	
87	Consumption .....	30	74	Rheumatism .....	1
57	Fever (typhoid) .....	6	7	Rupture .....	
18	Fracture .....		1	Skin disease .....	1
2	Fistula .....		23	Syphilis .....	
86	General debility (senility) .....	7	1	Tumor .....	
4	Gout .....		34	Ulcer .....	
20	Heart disease .....	5	49	Wound .....	
3	Hydrocele .....		23	Miscellaneous diseases .....	

Number of months reported .....	12	Discharged .....	481
Total on hand at commencement of year .....	59	Died .....	62
Total admitted .....	563	Percentage of deaths .....	9.08
Discharged cured .....	453	Remaining under treatment .....	79

*Name and location of hospital:* LOS ANGELES COUNTY HOSPITAL AND ALMSHOUSE, LOS ANGELES, California.

*Physician's name and Post Office address:* WALTER LINDLEY, 237 South Spring Street, Los Angeles, California.

### REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Bernardino Hospital for the year ending January 1, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
3	Insane .....		11	Consumption .....	
2	Fever .....		2	Old age .....	
21	Paralysis .....				

Number of months reported .....	12	Discharged .....	57
Total on hand at commencement of year .....	53	Died .....	20
Total admitted .....	111	Remaining under treatment .....	55
Discharged cured .....	57		

NOTE.—Nearly all of the patients admitted here are from a distance, and a large percentage have lung disease.

The present hospital accommodations are not as good as they should be, but we are building a new hospital that will be all that is required. Supplies, water, medical aid, and

everything about the hospital are all right, if the place were larger, which it will be in a short time.

*Name and location of hospital:* SAN BERNARDINO HOSPITAL, San Bernardino, California.  
*Physician's name and Post Office address:* J. C. PEACOCK, M.D., County Physician, San Bernardino, California.

### REPORT OF THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Kern County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
40	Malaria .....	1	1	Fracture .....	1
16	Malarious fever .....	2	1	Compound fracture .....	1
4	Consumption .....	3	1	Fracture of skull .....	1
12	Rheumatism .....	4	4	Shot wounds .....	12
1	Bronchitis .....	1	6	Abscesses .....	1
6	Pneumonia .....	1	1	Frozen feet .....	1
3	Dyspepsia .....	2	2	Burns .....	1
5	General debility .....	1	1	Contusion .....	1
2	Paralysis .....	1	1	Abscess of mammary glands .....	1
1	Lobar pneumonia .....	1	1	Amputation of leg .....	1
2	Dysentery .....	1	1	Tumor operation .....	1
3	Asthma .....	2	2	Operation of piles .....	1
4	Syphilis .....	6	6	Ulcers .....	1
1	Neuralgia .....	29	29	Indigent .....	1

Number of months reported .....	12	Discharged .....	14
Total on hand at commencement of year .....	12	Died .....	14
Total admitted .....	157	Percentage of deaths .....	.89
Discharged cured .....	119	Remaining under treatment .....	10

The Kern County Hospital is situated five hundred yards southwest of Bakersfield. The building covers four thousand eight hundred square feet. The wards are well ventilated. The building contains two wards, each eight beds, three single rooms, containing two beds each, office, dining room, kitchen, bath-room, and hallway. All medicines and supplies are furnished by the county—no contract system. Water is furnished by the Bakersfield Water Company. Each patient has an area of fifty-four square feet.

*Name and location of hospital:* KERN COUNTY HOSPITAL, Bakersfield, Kern County, California.

*Physician's name and Post Office address:* L. S. ROGERS, M.D., Bakersfield, California.

### REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Mendocino County Hospital for the year ending January 1, 1886.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
2	Cancer .....	2	1	Abscess .....	1
4	Phthisis .....	1	1	Stricture .....	1
1	Ovarian tumor .....	1	1	Loss of memory .....	1
10	Syphilis .....	3	3	Rheumatism (inflammatory) .....	1
3	Heart disease .....	5	5	Rheumatism (chronic articular) .....	1
2	Bright's disease .....	1	1	Diabetes .....	1
1	Cataract .....	1	1	Opium habit .....	1
2	Paralysis .....	5	5	General debility .....	1
4	Fractures .....	3	3	Intermittent fever * .....	1
2	Pneumonia .....	11	11	Old age and indigent .....	1
3	Typhoid fever .....	10	10	Relapses and returned for treatment during year .....	1
1	Chronic ulceration cornea .....				

\* Imported; does not originate here.

Number of months reported.....	12	Discharged.....	7
Total on hand at commencement of year.....	19	Died.....	3
Total admitted.....	58	Remaining under treatment.....	22
Discharged cured.....	45		

Hospital consists of three wards, substantially hard-finished. One ward has been in use three years; the other two, one year. Is located on dry, high ground. Has farm in connection with hospital. Ample surface area per patient. One Physician (visiting), who is also Superintendent. Sewerage and ventilation good. Supplies gotten by contract with local merchants.

*Name and location of hospital:* MENDOCINO COUNTY HOSPITAL, Ukiah City, California.

*Physician's name and Post Office address:* BARTON DOZIER, M.D., Ukiah City, Mendocino County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Joaquin County Hospital for the year ending January 1, 1885.*

Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....	Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....
7	Paralysis.....	3	1	Scalded arm and side.....	---
5	Scalp wounds.....	---	5	Cripples.....	---
32	Alcoholism.....	1	1	Pleurisy.....	---
41	Rheumatism.....	---	2	Insane (sent to asylum).....	---
3	Pneumonia.....	3	3	Abscess of lungs.....	---
1	Senility.....	---	3	Abscess of arms and legs.....	---
4	Dyspepsia.....	---	1	Heart disease.....	1
4	Asthma.....	1	2	Carbuncle.....	---
2	Chronic rheumatism.....	---	2	Remittent fever.....	---
1	Dropsy.....	1	1	Womb disease.....	---
3	Cystitis.....	---	2	Poison oak.....	---
22	General debility.....	1	1	Bronchitis.....	---
5	Broken ribs.....	---	1	Hernia.....	---
5	Gonorrhœa.....	---	---	Dislocated shoulder.....	---
16	Consumption.....	11	1	Chronic dysentery.....	1
2	Broken legs.....	---	1	Broken jaw.....	---
5	Injured hands.....	---	1	Hemorrhoids.....	---
5	Poverty.....	---	1	Scrofula of throat.....	1
1	Broken ankle.....	---	1	Epilepsy.....	---
7	Granulated eyelids.....	---	2	Sunstroke.....	---
1	Broken arm.....	---	2	Sciatic rheumatism.....	---
1	Injured foot.....	---	2	Indigestion.....	---
4	Sprained ankle.....	---	1	Sprained wrist.....	---
1	Injured side.....	---	1	Eczema.....	---
14	Ague.....	---	4	Blind.....	---
6	Ulcer of legs.....	---	1	Gangrene gout.....	---
1	Bubo.....	---	1	Idiot.....	---
3	Syphilitic rheumatism.....	---	2	Opium habit.....	---
1	Gunshot wound of knee.....	---	1	Hemorrhage.....	1
1	Salivated.....	---	2	Congestion of lungs.....	2
3	Typhoid fever.....	1	1	Uremic poison.....	1
2	Dislocated shoulder.....	---	2	Pemlia.....	---
5	Secondary syphilis.....	---	1	Meningitis.....	1

Number of months reported.....	12	Discharged.....	282
Total on hand at commencement of year.....	97	Died.....	32
Total admitted.....	330	Percentage of deaths.....	7.49
Discharged cured.....	170	Remaining under treatment.....	113

The hospital is located just without the eastern limits of the City of Stockton. The location is on level, valley land. The building is frame, facing the west, with wings to the north and south—with an extension from the center to the east. The center is three stories; the wings and extension two stories. There are, in addition, three other smaller buildings, two of which are used by patients. The ventilation is good. There was an average of one hundred and one patients during the year. There are thirty-eight acres of land, equal to thirty-seven per cent of an acre to each patient. The total expense of the institution was \$17,206 05 for the year. This sum covers everything. The daily per capita

cost of maintenance was 44½ cents. The food and clothing are ample and substantial. The main building has been occupied seven years. The drainage is defective. The water supply for hospital use is abundant, and of the best. It is insufficient for irrigating purposes. The physician does not reside in the hospital, but in the town. His salary is \$900, and he does \$1,500 worth of work. The hospital has a good supply of milk.

*Name and location of hospital:* COUNTY HOSPITAL, Stockton, San Joaquin County, California.

*Physician's name and Post Office address:* W. A. WASHINGTON, M.D., Stockton, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Sonoma County Hospital for the year 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
7	Pneumonia, acute.....	1	2	Milk leg, or embolism femoral artery.....	
12	Pneumonia, chronic.....		2	Insanity, acute.....	
12	Bronchitis, acute.....		1	Orchitis.....	
5	Bronchitis, chronic.....		1	Diabetes mellitus.....	
22	Consumption.....	8	1	Strangulated hernia.....	
15	Constitutional syphilis.....		1	Concussion of spine.....	
6	Rheumatism, acute.....		1	Anemia.....	
5	Rheumatism, chronic.....		1	Cystitis, chronic.....	
4	Paralysis.....		1	Bubo.....	
1	Apoplexy.....		1	Fistula in ano.....	
1	Concussion of brain.....		9	Fracture of legs.....	
1	Epilepsy.....		6	Fracture of arms.....	
3	Alcoholism.....		1	Fracture of patella.....	
10	Delirium tremens.....		2	Fracture of clavicle.....	
9	Dyspepsia.....		1	Gangrene from gunshot wounds.....	1
1	Chronic inflammation bowels.....		1	Traumatic peritonitis.....	1
3	Typhoid fever.....		1	Wound of brachial artery.....	
3	Meningitis, acute.....		2	Dislocation of shoulder.....	
1	Prog. locomotor ataxia.....		2	Fracture of ribs.....	
2	Cancer.....	1	4	Incised wounds.....	
2	Dysentery.....		1	Frost-bitten feet.....	
1	Cholera morbus.....		1	Rattlesnake bite.....	
2	Gonorrhoea.....		2	Palmar felon.....	
1	Piles.....		1	Anemia.....	
1	Hypochondriasis.....		1	Abscess.....	
3	Bright's disease.....	2	7	Sore legs (varicose).....	
1	Gout.....		7	Chills and fever.....	
3	Erysipelas.....		1	Ptyalism (from quicksilver mine).....	
1	Gastritis, acute.....		1	Mammary abscess.....	
2	Hydrocele.....		1	General debility.....	
4	Heart disease.....		2	Senile dementia.....	1
1	Aneurism aorta.....				

Number of months reported.....	12	Discharged.....	50
Total on hand at commencement of year.....	26	Died.....	15
Total admitted.....	167	Percentage of deaths.....	.0777
Discharged cured.....	90	Remaining under treatment.....	38

This building is somewhat more than twenty years old, made for fifteen or twenty patients at the most. As the county has increased in population the numbers in the hospital have kept pace, until now, in the Winter, we have occasionally over forty; at one time this Winter, forty-four patients. Of course it is entirely too crowded, but we hope to have a new building by Fall, outside of the city, which will be an honor to our county. This place is badly drained, and in no respect fitted to the use of the county for the purposes for which it is used. The Board of Supervisors allow me great latitude in furnishing supplies, and I get just what I think best, and they foot the bills. Of course they expect me to be economical; but what I mean to say is, they are very liberal.

*Name and location of hospital:* SONOMA COUNTY HOSPITAL, Santa Rosa, California.

*Physician's name and Post Office address:* R. PRESS SMITH, JR., Santa Rosa, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Tehama County Hospital for the year ending January 1, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
39	Fever, intermittent .....	---	2	Delirium tremens .....	---
1	Fever, pernicious intermittent .....	1	1	Urethral stricture .....	---
16	Fever, remittent .....	---	4	Pneumonia, croupous .....	1
3	Fever, typho-malarial .....	1	1	Epilepsy .....	---
4	Rheumatism, acute .....	---	2	Arthritis .....	---
6	Rheumatism, sub-acute and chronic .....	---	4	Fracture .....	---
---	Pulmonary consumption .....	2	1	Acute mania .....	---
11	Dysentery, acute .....	1	2	Heart, valvular lesion .....	---
4	Wounds .....	---	1	Burns .....	---
2	Wounds, gunshot .....	---	1	Acute meningitis .....	---
1	Rectal cancer .....	1	1	Cerebral apoplexy .....	1
1	Urethral fistula .....	---	2	Paralysis from apoplexy .....	---
---	---	---	---	Old age .....	1

Number of months reported .....	12	Discharged .....	15
Total on hand at commencement of year ..	20	Died .....	9
Total admitted .....	114	Percentage of deaths .....	6.72
Discharged cured .....	90	Remaining under treatment .....	20

*Name and location of hospital: TEHAMA COUNTY HOSPITAL, Red Bluff, California.**Physician's name and Post Office address: JOHN FIFE, M.D., Red Bluff, California.*

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the El Dorado County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
1	Chronic diarrhoea .....	1	2	Disease of heart .....	2
2	Phthisis pulmonalis .....	2	1	Dropsy pericardium .....	1
2	Typhoid malaria .....	2	1	Pneumonia .....	1
1	Apoplexy .....	1	2	Tertiary syphilis .....	2

Number of months reported .....	12	Discharged .....	20
Total on hand at commencement of year ..	59	Died .....	12
Total admitted .....	45	Percentage of deaths .....	5
Discharged cured .....	20	Remaining under treatment .....	63

With respect to location, conditions, sewerage, etc., I have explained it in a former report.

*Name and location of hospital: EL DORADO COUNTY HOSPITAL, Placerville, California.**Physician's name and Post Office address: H. W. A. WORTHEN, M.D., Placerville, California.*



## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Sierra County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
2	Fracture of tibia and fibula .....	.....	2	Burn (scald) .....	.....
1	Fracture of humerus .....	.....	1	Dog bite .....	.....
4	Dementia .....	3	1	Diarrhoea .....	.....
1	Cystitis, chronic .....	.....	1	Injury of ear .....	.....
2	Sciatica .....	.....	2	Heart disease .....	1
1	Coxalgia .....	1	3	Paralysis .....	.....
6	Rheumatism, chronic .....	.....	1	Paralysis, traumatic .....	.....
3	Pneumonia .....	.....	2	Pharyngitis .....	.....
3	Bronchitis .....	.....	1	Onanism .....	.....
9	Alcoholism .....	1	1	Hydrocele .....	.....
1	Hepatitis, chronic .....	.....	1	Wound of foot .....	.....
1	Consumption .....	.....	1	Wound of hand .....	.....
1	Fracture of patella .....	.....	1	General prostration .....	.....
1	Typhoid fever .....	.....	1	Pain in head and double vision .....	.....
1	Marasmus .....	1	1	Ulceration of cornea .....	.....
2	Neuralgia .....	.....	10	Old age .....	.....

Number of months reported .....	12	Discharged .....	15
Total on hand at commencement of year ..	19	Died .....	7
Total admitted .....	49	Percentage of deaths .....	9.07
Discharged cured .....	24	Remaining under treatment .....	22

You will observe ten patients set down to old age, which is true in this case. They are men who came to the mountains in early days. They have created no homes, and the shallow mines will no longer afford them a living, consequently they drift into the county hospital. Their ages range from seventy-two to eighty-five years. Our county hospital is calculated for twenty-four patients, is handsomely situated, and well supplied with pure mountain water. Elevation above the sea level, three thousand feet. The drainage into the Yuba River is complete.

*Name and location of hospital:* SIERRA COUNTY HOSPITAL, Downieville, Sierra County, California.

*Physician's name and Post Office address:* ALEMBy JUMP, M.D., Downieville, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Placer County Hospital for the year ending December 31, 1884.*

Total by each Disease.	DISEASES.	No. Deaths by each Disease.	Total by each Disease.	DISEASES.	No. Deaths by each Disease.
3	Blindness .....	1	1	Necrosis of tibia .....	1
5	Dropsy .....	2	1	Necrosis of foot .....	1
8	Heart disease .....	1	1	Hydrocele .....	1
3	Epilepsy .....	1	1	Impaction of colon .....	1
9	Paralysis .....	1	1	Railway injury .....	1
6	Bright's disease .....	4	1	Ozena .....	1
21	Rheumatism .....	2	2	Poison oak .....	1
17	Phthisis pulmonalis .....	4	1	Dementia .....	1
1	Dislocated shoulder .....	1	1	Stricture of rectum .....	1
5	Alcoholism .....	3	3	Stricture of urethra .....	1
4	Diabetes mellitus .....	1	1	Encephalitis .....	1
1	Lumbago .....	1	1	Stabbed in side .....	1
1	Unhealed stump .....	1	1	Renal congestion .....	1
6	Ulcer of leg .....	1	1	Knife wound of leg .....	1
2	Hernia .....	1	1	Bronchitis .....	1
1	Progressive locomotor ataxia .....	1	1	Iritis .....	1
3	Cancer .....	3	2	Herpes Zoster .....	2
22	Intermittent fever .....	1	2	Ulcer of lower jaw .....	1
2	Dyspepsia .....	1	1	Fracture thigh, comp. ....	1
1	Injury to forearm .....	1	1	Attempted suicide .....	1
3	Fracture of leg .....	1	3	Varicose ulcers .....	1
1	Crushed finger .....	1	1	Amputation finger .....	1
1	Sprained ankle .....	2	2	Amputation forearm .....	1
1	Erysipelas .....	1	1	Amputation toes .....	1
5	Asthma .....	1	1	Amputation leg .....	1
2	Scalp wound .....	1	1	Glossitis .....	1
1	Sprained leg .....	1	1	Gunshot wound .....	1
2	Tertiary syphilis .....	1	1	Burns .....	1
1	Insanity .....	1	1	Ptyalism .....	1
2	Abscess .....	1	1	Tapeworm .....	1
1	Spinal irritation .....	1	1	Impacted fracture, neck femur ..	1
2	Tumor .....	1	1	Emphysema .....	1
1	Stabbed shoulder .....	1	1	Fracture thigh and arm .....	1
2	Cataract .....	1	28	General debility .....	4

Number of months reported .....	12	Discharged .....	145
Total on hand at commencement of year ..	75	Died .....	20
Total admitted .....	150	Percentage of deaths .....	7.05
Discharged cured .....	97	Remaining under treatment .....	60

That part of Placer County Hospital first built in 1858, is now in poor condition, and will soon be rebuilt. Most of our present hospital is in good condition, having been built by additions as needed. The location is unsurpassed in any county. Sewerage very good. Ventilation very good. Necessary supplies abundant. Medical attendance daily. Surface area to each patient at present time (we are crowded), six square feet. A hospital was first located on our present grounds in 1858. Water supply abundant. Fine spring water on hospital grounds.

*Name and location of hospital:* PLACER COUNTY HOSPITAL, Auburn, California.

*Physician's name and Post Office address:* T. M. TODD, M.D., Auburn, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Placer County Hospital for the year ending February 29, 1885.*

Total by each Disease.	DISEASES.	No. Deaths by each Disease.	Total by each Disease.	DISEASES.	No. Deaths by each Disease.
5	Abscess .....	.....	16	Paralysis .....	3
3	Asthma .....	.....	18	Pulmonary phthisis .....	4
19	Alcoholism .....	1	1	Pneumonia .....	.....
5	Amputations .....	.....	2	Locomotor ataxia .....	.....
3	Blindness .....	.....	2	Poison oak .....	.....
4	Bright's disease .....	.....	31	Rheumatism .....	.....
2	Burns .....	.....	8	Remittent fever .....	.....
1	Bronchitis .....	.....	2	Renal congestion .....	.....
5	Cancer .....	1	2	Sprains .....	.....
4	Cataract .....	.....	2	Scalp wound .....	.....
6	Dropsy .....	1	1	Spinal irritation .....	.....
2	Dislocations .....	.....	3	Tumors, stomach .....	.....
2	Dyspepsia .....	.....	1	Unhealed stump .....	.....
2	Dementia .....	.....	13	Ulcers .....	1
27	Debility .....	5	1	Diarrhea, chronic .....	.....
4	Epilepsy .....	1	8	Stricture urethra .....	2
2	Emphysema .....	.....	5	Necrosis, tibia .....	.....
2	Erysipelas .....	.....	4	Syphilis .....	.....
1	Encephalitis .....	.....	1	Suicide .....	1
9	Fractures .....	.....	1	Parotitis .....	.....
2	Gastritis .....	.....	1	Gangrene, foot .....	1
3	Gunshot wounds .....	1	6	Lacerated wounds .....	.....
12	Heart disease .....	.....	1	Cystitis .....	.....
5	Hernia inguinal .....	.....	1	Aneurism of aorta .....	.....
1	Hydrocele .....	.....	1	Retention of urine .....	.....
2	Herpes Zoster .....	.....	1	Onanism .....	.....
29	Intermittent fever .....	.....	1	Hæmoptysis .....	.....
7	Railway injuries .....	.....	1	Ophthalmia .....	.....
1	Insanity .....	.....	1	Opium habit .....	.....
1	Impaction of colon .....	.....	2	Hemorrhoids .....	.....
4	Iritis .....	.....	1	Sciatica .....	.....
5	Knife wounds .....	.....	1	Fissure of anus .....	.....
1	Lumbago .....	.....	1	Testicles, injury of .....	.....
1	Ozæna .....	.....			

Number of months reported .....	12	Discharged .....	224
Total on hand at commencement of year ..	60	Died .....	23
Total admitted .....	263	Percentage of deaths .....	7.24
Discharged cured .....	175	Remaining under treatment .....	76

No additions since last year's report. No changes of any kind.

Name and location of hospital: PLACER COUNTY HOSPITAL, Auburn, Placer County, California.

Physician's name and Post Office address: T. M. TODD, Auburn, Placer County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Mateo County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
2	Consumption .....	2	1	Inguinal abscess .....	---
3	Paralysis .....	1	4	Arthritic rheumatism .....	---
1	Broken thigh .....	---	1	Injury of head .....	---
1	Broken tibia .....	---	1	Eczema .....	---
1	Mashed fingers .....	---	2	Delirium tremens .....	2
1	Chronic sciatica .....	---	1	Heart disease .....	1
1	Inguinal hernia .....	---	2	General debility .....	---
2	Alcoholism .....	1	1	Gonorrhœa .....	---
1	Chronic cough .....	---	1	Spinal injury .....	---
3	Old age .....	---	1	Ophthalmia .....	---
2	Dropsy .....	---	1	Tumor of hip .....	---

Number of months reported .....	12	Discharged .....	20
Total on hand at commencement of year ..	27	Died .....	7
Total admitted .....	38	Percentage of deaths .... About 10 per cent.	
Discharged cured .....	20	Remaining under treatment .....	38

The hospital is located on a farm of ninety acres, belonging to the county, situated in a small valley about five miles southwest of the town of San Mateo. It has been in operation about eight years. Sewerage, ventilation, and supplies good. The physician is required to visit it once a week, and oftener when needed, and make a quarterly report to Board of Supervisors, of those admitted, diseases, etc. The water is from a spring, good and ample for hospital purposes. The management is in the hands of a Superintendent, who is unusually well qualified for the position. Medicines are supplied by a wholesale house, and all ordinary prescriptions are put up by the Superintendent. I cannot now give the surface area to each patient, but the hospital is just now too much crowded, and the county will build an addition as soon as means can be provided. A large proportion of the inmates are decrepit old men.

*Name and location of hospital:* SAN MATEO COUNTY FARM AND HOSPITAL, San Mateo, San Mateo County, California.

*Physician's name and Post Office address:* L. D. MORSE, M.D., San Mateo, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Benito County Hospital for the term ending January 1, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
2	Chronic rheumatism .....	---	1	Hypertrophy of prostate .....	---
1	Acute rheumatism .....	1	1	Chronic hemorrhoids .....	---
1	Mollitis cerebri .....	1	1	Morphea poison .....	---
1	General debility .....	---	1	Wound in hand .....	---
1	Injury in head .....	---	1	Cellulitis pelvis .....	---
4	Phthisis .....	3	2	Dementia .....	1
4	Asthma .....	---	1	Varicose ulcer on leg .....	---
2	Quick consumption .....	1	2	Fever and ague .....	---
1	Constitutional syphilis .....	---	3	Chronic alcoholism .....	---
1	Wound in abdomen .....	---	1	Fistula in rectum .....	---
1	Gunshot wound .....	1			

Number of months reported .....	12	Discharged .....	10
Total on hand at commencement of year ..	23	Died .....	8
Total admitted .....	18	Remaining under treatment .....	3
Discharged cured .....	20		

This hospital is located near the business portion of the Town of Hollister, California, with but little convenience; is a combination hospital and poor (or county) house; sewerage and ventilation such as you would get in any small town close to the business portion, not of the best, nor yet of the worst. The hospital is let at so much per week (board) for each person. Medicines are furnished by contract, from drug store.

*Name and location of hospital:* SAN BENITO COUNTY HOSPITAL, Hollister, California.  
*Physician's name and Post Office address:* E. G. CAMPLIN, M.D., County Physician, Hollister, California.

# REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Fresno County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
5	Acute diarrhoea.....		5	Chronic gastritis.....	
2	Chronic diarrhoea.....		1	Varicose ulcers.....	
1	Dysentery.....		3	Paralysis.....	2
4	Erysipelas.....		5	Chronic rheumatism.....	
1	Typhoid fever.....		10	Acute rheumatism.....	
13	Remittent and intermittent.....		1	Lead poison.....	
1	Cerebro-spinal.....		1	Dropsy.....	
5	Phthisis pulmonalis.....	2	4	Fractures.....	
2	Chronic alcoholism.....		1	Bright's disease.....	1
4	Pneumonia.....		2	Gunshot wounds.....	1
2	Acute bronchitis.....		4	Incised wounds.....	1
5	Chronic bronchitis.....	1	4	Railroad injuries.....	3
3	Pleurisy.....		1	Heart disease.....	
3	Secondary syphilis.....		4	Opium fiends.....	1
2	Tertiary syphilis.....		3	Nephritis.....	
1	Hip joint disease.....		5	Gastric fever.....	
1	Blind.....		3	Sprains and dislocations.....	
Number of months reported.....		12	Discharged.....		14
Total on hand at commencement of year.....		17	Died.....		12
Total admitted.....		112	Percentage of deaths.....		0.11
Discharged cured.....		65	Remaining under treatment.....		21

Please find all information respecting condition, location, sewerage, ventilation, supplies, medical attendance, surface area to each patient, length of time occupied, water supply, etc., in my report of December 31, 1878. There has been no change made since that time, and all is working well.

*Name and location of hospital:* FRESNO COUNTY HOSPITAL, Fresno County, California.  
*Physician's name and Post Office address:* LEWIS LEACH, M.D., Fresno, Fresno County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Santa Cruz County Hospital for the year ending December 31, 1885.*

Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....	Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....
3	Pregnancy .....		1	Dysentery .....	
2	Bronchitis .....		4	Rheumatism .....	
5	Consumption .....	2	2	Erysipelas .....	
4	Heart disease .....		2	Conjunctivitis .....	
5	Fractures .....		1	Pneumonia .....	
1	Fractured vertebrae .....	1	1	Neuralgia .....	
16	Wounds and injuries .....		3	Intermittent fever .....	
1	Dislocation .....		1	Hipjoint disease .....	
10	Old age .....		1	Urethritis .....	
4	Indigent miners .....		1	Epilepsy .....	
2	Cripples .....		1	Synovitis .....	
1	Delirium tremens .....		1	Lead poison .....	
3	Alcoholism .....		1	Stricture of urethra .....	
1	Asthma .....		1	Epistaxis .....	
6	Paralysis .....	3	2	Poison oak .....	
1	Syphilis .....		3	Skin disease .....	
6	Debility .....	1	2	None given .....	
4	Typhoid fever .....	1			

Number of months reported .....	12	Discharged .....	85
Total on hand at commencement of year .....	19	Died .....	8
Total admitted .....	84	Percentage of deaths .....	8
Discharged cured .....	None.	Remaining under treatment .....	18

*Name and location of hospital:* SANTA CRUZ COUNTY HOSPITAL, Santa Cruz, California.*Physician's name and Post Office address:* BENJAMIN KNIGHT, M.D., County Physician, Santa Cruz, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Fresno County Hospital, for the year ending December 31, 1885.*

Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....	Total by each Disease.....	DISEASES.	No. Deaths by each Disease.....
1	Abscess, throat .....		7	Gastritis, chronic .....	
1	Abscess, liver .....		5	Gunshot wounds .....	1
2	Bronchitis, acute .....	1	1	Hip joint disease .....	
3	Bronchitis, chronic .....	1	1	Heart disease .....	1
3	Bright's disease .....	1	1	Hysteria .....	
1	Brain, inflammation .....	1	1	Hernia, strangulated .....	
1	Childbirth .....		3	Incised wounds .....	
1	Carbuncle .....		2	Lung congestion .....	1
2	Cystitis .....		2	Neuralgia, facial .....	
1	Diarrhoea, acute .....		2	Nasal catarrh .....	
3	Diarrhoea, chronic .....	1	1	Opium fiend .....	1
1	Dislocation shoulder .....		3	Paralysis .....	1
3	Dropsy .....		1	Pleurisy, acute .....	
1	Epilepsy .....		2	Pleurisy, chronic .....	
1	Eye injury .....		5	Phthisis .....	1
1	Eczema .....		1	Pneumonia .....	
47	Intermittent fever .....		3	Railroad injuries .....	3
3	Fever, typhoid .....		21	Rheumatism .....	
4	Fever, continued .....		1	Spinal injury .....	1
4	Fracture, leg .....		4	Syphilis secondary .....	
3	Fracture, arm .....		12	Syphilis, tertian .....	
1	Fracture, scapula .....		6	Varicose ulcers .....	
2	Gastritis, acute .....		1	Chronic alcoholism .....	

Number of months reported .....	12	Discharged .....	19
Total on hand at commencement of year ..	21	Died .....	15
Total admitted .....	159	Percentage of deaths .....	8.33
Discharged cured .....	100	Remaining under treatment .....	25

For particulars regarding sewerage, ventilation, supplies, and medical attendance, see former report, as there has been no change made since 1876.

*Name and location of hospital:* FRESNO COUNTY HOSPITAL, Fresno County, California.

*Physician's name and Post Office address:* LEWIS LEACH, M.D., Fresno, Fresno County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Lassen Hospital for the year ending December 31, 1884.*

Total by each Disease.....	DISEASES.		No. Deaths by each Disease.
1	Heart .....		1

Number of months reported .....	9	Discharged .....	4
Total on hand at commencement of year.....	None.	Died .....	1
Total admitted .....	5	Percentage of deaths .....	0.5
Discharged cured .....	3	Remaining under treatment .....	None.

Lassen had no hospital until May, 1884, when quite a commodious building was mostly completed, one mile from Susanville, on Susan River, two stories high, with five rooms below and four above—not entirely finished, but are in process of completion—with a good cellar underneath. Abundance of water from the river in pipes; also a good well. The building is twenty-six by thirty-two feet, rooms ten feet high below, and nine above; a bath-room and other modern appliances for the convenience and comfort of the sick. The lands comprise one hundred and sixty acres of land, watered by Susan River, with a Government title, a portion of which is under cultivation, an orchard and garden, where patients can avail themselves of exercise if they choose, or go a fishing, if so disposed, in the river by the door.

*Name and location of hospital:* LASSEN HOSPITAL, Susanville, California.

*Physician's name and Post Office address:* Z. M. SPALDING, M.D., Susanville, Lassen County, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Diego County Hospital for the year ending December 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
13	Phthisis pulmonalis .....	5	1	Ophthalmia, traumatic .....	---
4	Rheumatism (two chronic) .....	---	1	Cirrhosis of liver .....	1
1	Acute double pneumonia .....	1	1	Varicose veins of left leg .....	---
2	Chronic pneumonia .....	1	1	Lumbago .....	---
2	Chronic cystitis .....	1	1	Eczema, left leg .....	---
5	Syphilis (one secondary, two tertiary) .....	---	1	Rectal abscess .....	---
4	Bronchitis (two chronic) .....	1	1	Amputation of left middle finger, bitten by man .....	---
1	Softening of brain .....	1	1	Incised wound of ant. tibial artery .....	---
6	Hemiplegia (two right, with ap- pasia) .....	1	1	Acute diarrhoea .....	---
2	Paraplegia, partial .....	---	1	Contused wound of left hip by a fall .....	---
2	Epilepsy .....	---	1	Endometritis .....	---
1	Chronic diarrhoea .....	---	1	Leucocythemia .....	---
1	Fracture of left tibia .....	---	1	Retention of urine, traumatic .....	---
1	Cerebral congestion .....	1	1	General debility .....	---
1	Locomotor ataxia .....	1	1	Hernia .....	---
2	Varicose ulcers of legs .....	---	1	Asthma .....	---
1	Orchitis, gonorrhœal .....	---	1		
1	Hepatitis .....	---			

Number of months reported .....	12	Discharged .....	7
Total on hand at commencement of year .....	16	Died .....	13
Total admitted .....	50	Percentage of deaths .....	5.07
Discharged cured .....	24	Remaining under treatment .....	12

*Name and location of hospital :* SAN DIEGO COUNTY HOSPITAL, San Diego, California.*Physician's name and Post Office address :* C. M. FENN, M.D., Fifth Street, between F and G Streets, San Diego, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the San Luis Obispo County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
3	Typhoid fever .....	1	1	Epilepsy .....	---
2	Intermittent fever .....	---	1	Poison oak .....	---
2	Diarrhoea .....	---	1	Hemorrhoids .....	---
1	Dysentery .....	---	2	Varix .....	---
2	Dropsy (probably Bright's disease) .....	2	1	Paronychia .....	---
1	Jaundice .....	---	1	Fistula in ano .....	---
6	Bronchitis .....	---	3	Fracture leg .....	---
4	Phthisis .....	2	1	Fracture jaw .....	---
1	Asthma .....	---	1	Fracture skull .....	1
1	Collapse of lung .....	---	1	Dislocation of shoulder .....	---
1	Heart disease .....	---	1	Contusion of foot .....	---
5	Rheumatism .....	---	1	Contusion of abdomen .....	---
1	Cystitis .....	---	1	Contusion of side .....	---
1	Cirrhosis of liver .....	---	1	Contusion of stump .....	---
2	Paralysis .....	---	1	Sprain .....	---
1	Hemiplegia .....	---	1	Ulcer of leg .....	---
1	Sciatica .....	---	1	Ulcer of ankle .....	---
2	Dementia .....	---	1	Lacerated arm .....	---
2	Alcoholism .....	---	1	Stricture of urethra .....	---
				Suicide .....	1



Number of months reported.....	12	Discharged cured.....	48
Total on hand at commencement of year.....	10	Died.....	7
Total admitted.....	61	Remaining under treatment.....	16

*Name and location of hospital:* COUNTY HOSPITAL, San Luis Obispo, California.

*Physician's name and Post Office address:* W. W. HAYS, M.D., San Luis Obispo, California.

### REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Sierra County Hospital for the year ending January 1, 1885.*

Total by each Disease.	DISEASES.	No. Deaths by each Disease.	Total by each Disease.	DISEASES.	No. Deaths by each Disease.
7	Old age.....	1	1	Cystitis.....	—
1	Traumatic paralysis.....	—	1	Insanity.....	—
1	Anæmia.....	—	3	General paralysis.....	1
1	Congenital deformity.....	—	1	Ulcers on leg.....	—
3	Syphilis.....	—	2	Fever, intermittent.....	—
2	Pain in head.....	—	2	Inflammation of eyes.....	—
1	Fracture tibia and fibula.....	—	1	Chronic diarrhœa.....	—
2	Sciatica.....	—	1	Consumption.....	1
1	Asthma.....	—	2	Ascites.....	1
12	Alcoholism.....	1	1	Amputation of finger.....	—
1	Hydrocele.....	—	1	Abscess of lung.....	1
1	Onanism.....	—	1	Cataract.....	—
4	Pneumonia.....	2	3	Fever, typhoid.....	1
1	Pharyngitis.....	—	1	Bursa.....	—
5	Rheumatism.....	—	1	Chronic nephritis.....	1
1	Pleuro-pneumonia.....	—	1	Scalded foot.....	—
1	Hepatitis.....	—	—	—	—

Number of months reported.....	12	Discharged.....	38
Total on hand at commencement of year.....	22	Died.....	10
Total admitted.....	46	Remaining under treatment.....	20
Discharged cured.....	28		

*Name and location of hospital:* SIERRA COUNTY HOSPITAL, Downieville, California.

*Physician's name and Post Office address:* ALEMBY JUMP, M.D., Downieville, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Kern County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
32	Malarial fever.....	3	1	Typhoid fever.....	1
5	Paralysis.....	1	2	Quinsy.....	1
2	Erysipelas.....	1	3	Shot different parts body.....	1
3	Consumption.....	1	2	Syphilis.....	1
4	Bronchitis.....	1	1	General debility.....	1
1	Diabetes.....	1	1	Compound fractures.....	1
3	Carbuncles.....	2	2	Fistula.....	1
6	Pneumonia.....	2	1	Hemorrhage of the bowels.....	1
2	Ulcer.....	2	2	Hemorrhage of the lungs.....	1
5	Fracture of the leg.....	1	1	Amputations of the leg.....	1
9	Rheumatism.....	1	1		

Number of months reported.....	12	Died.....	10
Total on hand at commencement of year.....	15	Percentage of deaths.....	10
Total admitted.....	199	Remaining under treatment.....	15
Discharged cured.....	160		

The Kern County Hospital is situated about a half mile from the town of Bakersfield; containing two wards, thirty by eighteen; each ward contains eight beds; three separate rooms containing two beds each; one office, one dining-room. Ventilation good. Receive water supply from Bakersfield Water Company. Medicine furnished by county. No contract system.

*Name and location of hospital:* KERN COUNTY HOSPITAL, Bakersfield, California.

*Physician's name and Post Office address:* DR. L. A. ROGERS, Bakersfield, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Inyo County Hospital for the year ending January 31, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease.	Total by each Disease	DISEASES.	No. Deaths by each Disease.
4	Surgical cases.....	1	1	Paralysis.....	1
2	Chronic rheumatism.....	1	1	Arthritis.....	1
1	Hernia.....	1	2	Syphilis.....	1
1	Tuberculosis.....	2	2	Periostitis.....	1
2	Lead colic.....	1	1		

Number of months reported.....	9	Discharged.....	2
Total on hand at commencement of year.....	4	Died.....	None.
Total admitted.....	13	Percentage of deaths.....	None.
Discharged cured.....	7	Remaining under treatment.....	7

*Name and location of hospital:* INYO COUNTY HOSPITAL, Independence, California.

*Physician's name and Post Office address:* B. E. STEVENSON, M.D., Independence, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Lake County Hospital for the year ending December 31, 1884.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
10	Rheumatism.....	2	20	Consumption.....	10
1	Cancer.....	1	2	Amaurosis.....	
11	Syphilis.....	2			
Number of months reported.....		12	Discharged.....		25
Total on hand at commencement of year.....		10	Died.....		15
Total admitted.....		34	Remaining under treatment.....		2
Discharged cured.....		10			

Lake County has no organized hospital. The cases noted above, nearly all of them, came in the county at a comparatively late date, seeking relief from chronic ailments at some one of the many mineral springs, in many instances reaching here without money; others, later becoming destitute, then cared for at public expense.

*Name and location of hospital:* LAKE COUNTY HOSPITAL, Lakeport.

*Physician's name and Post Office address:* H. J. CRUMPTON, M.D., Lakeport, California.

## REPORT TO THE STATE BOARD OF HEALTH OF THE INDIGENT SICK

*Treated in the Tuolumne County Hospital for the year ending March 5, 1885.*

Total by each Disease	DISEASES.	No. Deaths by each Disease	Total by each Disease	DISEASES.	No. Deaths by each Disease
3	Asthma.....		12	Paralysis.....	2
3	Pneumonia.....		6	Phthisis pulm.....	2
6	Rheumatism.....		4	Dysentery.....	
1	Cancer.....	1	2	Anasarc.....	
2	Syphilis.....		2	Ulcerated bowels.....	1
1	Varicose ulcer (leg).....		1	Diabetes insip.....	
6	Malaria.....		2	Diabetes mellitus.....	
2	Fractures.....		1	Bright's disease.....	
2	Hydrocele.....		1	Cystitis.....	
1	Pigment liver.....	1	1	Insanity.....	
1	Aneurism aorta.....	1	2	Ophthalmia.....	
2	Ecthyma.....		1	Softening of brain.....	

Number of months reported.....	12	Discharged cured.....	30
Total on hand at commencement of year.....	32	Died.....	8
Total admitted.....	46	Remaining under treatment.....	40

*Name and location of hospital:* TUOLUMNE COUNTY HOSPITAL, Sonora, Tuolumne County, California.

*Physician's name and Post Office address:* W. E. EICHELROTH, M.D., Sonora, Tuolumne County, California.

## REPORT OF DEATHS

For the Months of July, August, September, October, November, and December, 1884, of those Dying in different parts of the State of California.

CAUSES OF DEATH.	SEXES.			AGES.									NATIVITIES.				
	Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained
I.—ZYMOTIC OR EPIDEMIC.																	
Cholera	0													5	3		
Cholera morbus	9	3	5	4	16								1	77	2	1	
Cholera infantum	81	43	29	65	12									14	3	8	1
Diarrhoea	26	15	10	12										9	3	12	
Dysentery	24	15	8	3	2									0	0	1	
Smallpox	1	1	0											6	0	0	
Measles	6	3	3	3	3									17	5	6	
Scarlatina	17	10	7	1	10	4	2							55	1		
Diphtheria	66	33	33	1	24	23	14	2	1	1				27			
Croup	28	11	17	5	10	10	3							0			
Influenza	0													3	3	2	
Whooping-cough	3	1	2	1	2	1		2	1	1	1		1	8		6	
Erysipelas	13	5	8	5	1	1		1	2	2				2			
Fever—Typhus	8	6	2	1	1									3			
Typhoid	101	64	37		8	9	13	27	16	10	9	5	4	36	20	45	
Remittent and intermittent	24	16	6	1	1	5	4	4	6	6	2	1	4	6	6	11	1
Cerebro-spinal	32	19	13	13	9	2	2	2	1	3	1	2		24	6	2	
Syphilis	11	9	2	3				1	4					4	1	6	
Alcoholism (direct or remote), including delirium tremens	42	33	9					5	15	10	9	2	1	8	12	21	1
II.—CONSTITUTIONAL DISEASES.																	
Hydrocephalus	23	12	11	11	8	2	2							20	3		
Meningitis	78	43	35	23	32	9		2	4	5		3		50	7	10	11
Phthisis pulmonalis	481	316	165	2	5	4	58	115	112	85	48	28	24	106	134	231	10
Marasmus	110	59	51	92	5	3		4	3		2		1	94	2	12	2
Scrofula	7	3	4	1			1	2	2	1				4		3	
Rheumatism	11	4	7					5			5	1		5		6	

Cancer	90	37	52	1	23	12	1	1	5	18	22	19	25	4	20	38	25
III.—LOCAL DISEASES.																	
Pneumonia.....	166	115	48	3	17	8	1	9	12	26	34	17	22	10	48	35	80
Pleurisy.....	5	5							2		1	1		1	1	3	1
Bronchitis.....	60	38	21	1	6	4			6	10	5	4	10		23	2	35
Other diseases of respiratory organs.....	62	46	16		31	9			9	11	18	5	7	2	15	5	42
Enteritis.....	55	34	21	31	1	1	1	1	1	2	4	1	6		37	1	16
Gastritis.....	22	12	10		1	1	1	3	5	3	4		4		5	2	15
Gastro-enteritis.....	10	4	6		5	1	0	1		1	1		1		6	0	4
Peritonitis (non-puerperal).....	40	20	20					1	2	6	11	9	5		6	6	4
Diseases of the liver.....	53	32	21			0	1	0	4	15	11	7	11	4	10	6	37
Other diseases of stomach and bowels.....	30	19	11		13	1	1	1	3		6	5			13	9	8
Bright's disease and nephritis.....	71	48	21	2	1			2	10	16	16	10	15	1	16	22	31
Anæmia.....	8	7	1	2				2	1	1	1	2	1		2	6	6
Heart diseases.....	202	120	71	11	4	1	4	6	19	29	38	42	45	14	26	56	118
Convulsions.....	92	64	28		75	11	5				1				79	3	10
Other diseases of brain and nervous system.....	69	33	34	2	13	7		1	4	6	13	11	13	1	16	14	39
IV.—DEVELOPMENTAL DISEASES.																	
Puerperal diseases.....	25		25						14	11					5	7	13
Old age.....	58	27	31									1	57		4	14	37
V.—EXTERNAL CAUSES.																	
Suicide.....	44	25	5	14			2	1	7	8	11	6	8	1	3	7	23
Heat, death from—sunstroke.....																	11
All other causes not classified.....	776	490	256	21	111	27	32	33	84	66	57	117	149	100	189	362	161
Stillbirths.....	141	60	62	19											141		64
Totals.....	3,281	1,969	1,224	88	547	218	120	162	367	404	381	336	433	172	1,216	798	1,416

## REPORT OF DEATHS

For the months from June 30, 1884, to June 30, 1885, of those Dying in the State of California.

CAUSES OF DEATH.	SEXES.		AGES.								NATIVITIES.									
	Total		Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained	
I.—ZYMOTIC OR EPIDEMIC.																				
Cholera	0	0	0	0	0	6				2	2		1	1	2	8	3	2	1	3
Cholera morbus	14	75	56	22	108	31		1	5	5	8	5	2	7	3	140	7	3	3	1
Cholera infantum	153	36	57	36	2	33	6	3		5	5	5	2	10	8	35	11	21	28	
Diarrhoea	63	40	16	7	10	13	2	1	1	11	3	2	1	0	0	33	9	21		
Dysentery	1	1	0	0	0	0	0	0	0	0	2	1				79	3	2		
Smallpox	1	1	0	0	0	0	0	0	0	0	2	1				49				11
Measles	84	31	45	8	26	36	5		3	3						208	13	31	20	
Scarlatina	60	26	18	16	9	25	11		24							113	3			
Diphtheria	265	131	118	16	9	112	103	29	6											
Croup	136	61	69	6	18	58														
Influenza	0	0	0	0																
Whooping-cough	23	19	4		12	7										20	1			2
Erysipelas	23	9	13	1	6	2	2			4	2	3	2	1	1	11	5	7		
Fever—Typho-malarial	11	9	2		1	2	1			2	3					4	1	6		
Typhoid	222	119	89	14		13	15	41	56	34	18	18	10	14		85	40	91	6	
Remittent and intermittent	60	32	20	8	3	6	3	7	13	7	10	4	1	6		19	19	19	3	
Cerebro-spinal	73	40	27	6	24	16	6	7	7	2	2	1	4	4		52	12	6	3	
Syphilis	17	15	2		4				2	5	6					7	3	7		
Alcoholism (direct or remote), including delirium tremens	111	73	27	11					12	24	34	18	12	11		25	29	55	2	
II.—CONSTITUTIONAL DISEASES.																				
Hydrocephalus	44	28	16		17	19	4		3							39	4	1		
Meningitis	214	110	99	5	53	68	26	7	9	9	1	5	6			143	15	23	33	
Phthisis pulmonalis	1,227	718	424	85	8	12	12	103	270	304	201	3	81	119		254	363	564	46	
Marasmus	269	145	121	3	193	26	8	2	10	7	3	5	8	4		217	10	33	9	
Scrofula	12	7	5		1	1	1	2	2	3	2	1	7	1		7	1	4		
Rheumatism	20	10	10			1	1		6							8	3	9		

Cancer	208	102	98	8				1	11	28	50	55	57	6	11	53	113	31
III.—LOCAL DISEASES.																		
Pneumonia	552	337	183	32	76	72	36	22	41	58	75	51	72	46	225	113	196	17
Pleurisy	17	15	2	1	1	1	1	1	4	4	4	1	3	1	2	5	9	1
Bronchitis	181	101	73	4	45	37	4	2	13	17	11	10	34	8	90	44	76	1
Other diseases of respiratory organs	154	106	43	5	21	13	2	4	16	20	33	16	15	11	10	25	81	7
Enteritis	135	72	63	17	70	45	2	7	3	8	9	16	11	37	88	9	37	1
Gastritis	36	19	17	2	1	1	1	5	8	5	9	2	4	—	5	6	25	—
Gastro-enteritis	22	10	10	2	7	1	—	2	2	4	2	2	2	—	9	3	9	1
Peritonitis (non-puerperal)	73	33	37	3	9	1	2	5	17	15	12	9	9	3	16	20	36	1
Diseases of the liver	120	75	45	1	—	—	1	1	8	27	32	20	25	4	18	24	77	1
Other diseases of stomach and bowels	49	32	16	1	15	1	1	2	5	1	10	6	7	1	20	13	15	1
Bright's disease and nephritis	140	92	41	4	1	2	1	5	22	22	32	21	30	1	28	43	65	4
Aneurism	23	19	4	—	—	—	—	1	2	6	4	8	2	—	37	63	7	16
Heart diseases	486	290	168	28	6	1	6	23	42	53	110	92	116	37	63	156	251	13
Convulsions	211	127	80	4	100	39	8	—	—	—	1	1	1	1	191	3	4	13
Other diseases of the brain and nervous system	142	75	64	3	21	13	2	1	9	13	21	19	29	5	37	29	71	5
IV.—DEVELOPMENTAL DISEASES.																		
Puerperal diseases	38	—	38	—	—	—	—	1	21	15	1	—	—	—	6	14	18	—
Old age	140	82	52	6	—	—	—	—	—	—	—	1	137	2	9	47	75	9
V.—EXTERNAL CAUSES.																		
Suicide	107	77	16	14	—	—	2	1	22	21	24	17	11	6	4	21	66	16
Heat, death from—sunstroke	1,913	1,172	591	160	228	56	52	72	181	122	108	241	321	469	526	363	615	116
All other causes not classified	291	142	133	19	—	—	—	—	—	—	—	—	—	—	291	—	—	—
Stillbirths	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	8,228	4,741	3,002	495	1,217	709	355	368	836	865	917	768	1,013	868	3,212	1,757	2,794	445

## REPORT OF DEATHS

From January 1 to June 30, 1885, of those Dying in the State of California.

CAUSES OF DEATH.	SEXES.			AGES.								NATIVITIES.							
	Total	Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained	
I.—ZYMOTIC OR EPIDEMIC.																			
Cholera	0	0	0	0	2				1	1				1	3				
Cholera morbus	5	3	1	13	44	16								12	63	5	1	3	
Cholera infantum	72	32	27	1	41	3			4	1	6	2	3	3	21	8	13	27	
Diarrhoea	69	42	26	1	7	11			1	1	3		6	4	24	6	9		
Dysentery	39	25	9	5	0														
Smallpox	0	0	0	0	0	0													
Measles	78	28	42	8	23	33	5			2	1		1	13	73	3	2		
Scarlatina	43	16	11	16	1	15	7	1						19	32	0	0	11	
Diphtheria	199	98	85	16	8	88	80	10	1	2				10	153	8	28	10	
Croup	108	50	52	6	13	48	19	3						25	86	2		20	
Influenza	0	0	0	0															
Whooping-cough	20	8	6	6	11	5								4	17	1	1	2	
Erysipelas	10	4	5	1	1	1			2	1	2	1	1	1	4	4	5	1	
Fever—Typho-malarial	3	3	0	0		1			1	1					2	1			
Typhoid	121	55	52	14	14	5	6	31	29	18	8	9	5	10	49	20	46	6	
Remittent and intermittent	36	16	14	6	2	2	2	2	9	7	4	2		2	13	13	8	2	
Cerebro-spinal	41	21	14	6	11	7	4	5	5	1	2		2	4	28	6	6	1	
Syphilis	6	6	0	0	1				1	1	3	1		1	3	2	1		
Alcoholism (direct or remote), including delirium tremens	69	40	18	11					7	9	24	9	10	10	17	17	34	1	
II.—CONSTITUTIONAL DISEASES.																			
Hydrocephalus	21	16	5		6	11	2	1							19	1	1		
Tubercular meningitis	136	67	64	5	30	36	17	7	7	5	2	5	3	14	93	8	13	22	
Phthisis pulmonalis	746	402	259	85	6	7	8	45	155	192	116	69	53	95	148	259	333	36	
Marasmus	139	86	70	3	101	24	5	2	6	4	3	3	8	3	123	8	21	7	
Scrofula	5	4	1			1	1	1	1	1	1	1			3	1	1		
Rheumatism	9	6	3			1			1	2	1	2	1	1	3	3	3		



Cancer	118	65	46	7				6	10	28	36	32	6	7	33	75	3
III.—LOCAL DISEASES.																	
Pneumonia	386	222	135	29	53	60	35	13	32	41	34	50	36	178	78	116	14
Pleurisy	12	10	2		1	1	1		2	3		3		2	4	6	
Bronchitis	121	65	52	3	28	29	4	2	7	6	6	24	8	67	12	41	1
Other diseases of the respiratory organs	92	60	27	5	18	9	2	4	7	9	15	11	8	25	21	39	7
Enteritis	80	38	42		39	6	1	6	3	6	5	9	5	51	8	21	
Gastritis	14	7	7					2	3	2	5	2			4	10	
Gastro-enteritis	12	6	4	2	2			1	1	4	1	2			3	5	1
Peritonitis (non-puerperal)	33	13	17	3		1	1	3	11	4	3	4	3	10	8	14	1
Diseases of the liver	67	43	21		2			1	4	12	13	11			18	40	1
Other diseases of stomach and bowels	19	13	5	1	2	1		1	2	1	4	1		7	4	7	1
Bright's disease and nephritis	69	44	23	2	3	2	1	3	12	6	16	11	15	12	21	34	2
Aneurism	15	12	3						5	3	6	1			5	10	
Heart diseases	281	170	97	17	2		2	17	23	24	72	50	71	40	100	133	11
Convulsions	119	63	52	4	85	28	3					1	1	112	3	1	3
Other diseases of brain and nervous system	73	42	30	1	11	6	2	3	5	7	11	8	16	4	21	15	5
IV.—DEVELOPMENTAL DISEASES.																	
Puerperal diseases	13		13					1	7	4	1			1	7	5	
Old age	82	35	21	6								80	2	5	33	38	6
V.—EXTERNAL CAUSES.																	
Suicide	63	52	11						15	16	13	11	3	5	1	11	43
Heat, death from—sunstroke	0	0	0	0													
All other causes not classified	1,137	673	335	129	117	29	20	39	100	56	111	124	172	337	231	481	82
Stillbirths	153	82	71														
Totals	4,937	2,762	1,783	412	670	491	233	206	469	461	536	432	610	2,027	962	1,676	292

# REPORT OF DEATHS

For the months from June 30, 1885, to June 30, 1886, of those dying in the State of California.

CAUSES OF DEATH.	SEXES.			AGES.										NATIVITIES.			
	Male	Female	Unascertained	Under 1 year	1 and under 5 years	5 and under 10 years	10 and under 20 years	20 and under 30 years	30 and under 40 years	40 and under 50 years	50 and under 60 years	60 and under 100 years	Unascertained	Pacific States	Atlantic States	Foreign Countries	Unascertained
I.—ZYMOTIC OR EPIDEMIC.	0	0	0	2	2	3			1	3	1	1	5	8	3	4	3
Cholera	18	8	3	131	26	2							10	162	1	9	6
Cholera morbus	169	81	12	49	7	3	1			3	2	7	5	44	7	19	17
Cholera infantum	77	46	27	1	1	1			3	3	5		3	15	4	1	1
Diarrhoea	39	25	13	10	3	1											
Dysentery	0	0	0														
Smallpox	31	11	4	8	12	1	1	2	1	2	1		3	26	2	2	1
Measles	65	21	20	11	26	14	7						7	48	2	2	15
Scarlatina	374	185	168	15	152	123	42	7			2	3	30	311	25	15	20
Diphtheria	163	90	63	20	87	30	5	1					22	149	6	6	5
Croup	2	1															
Influenza	47	21	23	31	95	1	1	2	3	2	7	3	5	5	13	4	2
Whooping-cough	22	15	6	1	3	1	1						3	13	8	4	7
Erysipelas	32	12	6	3	4	4	6	1	1	4	4	2	3	82	51	67	25
Fever—Typho-malarial	225	125	78	22	1	19	39	56	25	21	17	14	19	82	13	10	16
Typhoid	46	21	23	5	3	7	6	3	3	5	2	6	3	23	9	7	7
Remittent and intermittent	95	37	38	31	17	11	6	5	3	2	1	2	13	64	4	4	6
Cerebro-spinal	14	8	6	3	0	0	1	2									
Syphilis																	
Alcoholism (direct or remote), including delirium tremens	113	70	33	1			2	8	19	32	26	19	6	7	35	61	10
II.—CONSTITUTIONAL DISEASES.																	
Hydrocephalus	53	34	17	22	22	7	1	1	16	18	7	8	5	47	4	2	16
Tubercular meningitis	224	117	94	65	66	24	6	9	9				113	155	25	28	26
Phthisis pulmonalis	1,540	871	492	177	9	14	126	415	291	297	165	113	131	343	427	537	213
Marasmus	303	170	132	1	21	3	4	7	15	9	15	28	4	197	20	54	32
Scrofula	9	8	1	3			2	1	1		1	1		4	1	3	1
Rheumatism	22	13	8				2	1		1	8	10		2	7	12	1

Cancer	208	117	100	21	1	1	1	1	10	31	98	88	54	14	25	92	103	18
III.—LOCAL DISEASES.																		
Pneumonia	604	359	210	35	106	91	8	28	56	68	64	62	92	29	257	107	208	32
Pleurisy	16	11	5	12	64	7	3	4	6	1	4	1	3	29	3	5	8	8
Other diseases of respiratory organs	194	108	74	12	21	18	4	11	12	9	15	21	33	26	96	25	65	8
Enteritis	115	71	36	8	21	18	4	11	3	17	15	5	13	8	50	25	23	17
Gastritis	163	89	72	2	39	17	1	8	8	5	10	8	6	1	113	14	30	6
Gastro-enteritis	70	34	25	11	14	5	2	1	7	8	11	8	8	6	22	11	25	12
Peritonitis (non-puerperal)	14	6	8	3	3	3	2	1	1	1	1	1	1	1	1	7	4	2
Diseases of the liver	87	44	40	3	8	6	1	3	20	20	12	8	7	2	27	21	34	5
Other diseases of stomach and bowels	147	102	41	4	1	1	1	2	10	24	40	31	35	3	12	25	101	9
Bright's disease and nephritis	47	25	17	5	7	4	2	2	5	5	6	8	6	2	13	18	13	3
Aneurism	134	85	43	6	1	3	2	6	12	17	31	24	35	3	15	45	63	11
Heart diseases	28	23	3	2	1	1	1	1	4	4	11	10	1	1	2	2	23	1
Convulsions	547	329	195	23	4	4	9	18	44	64	110	101	176	27	82	163	263	33
Other diseases of brain and nervous system	246	125	114	6	151	67	5	2	2	2	3	3	4	6	226	---	---	20
IV.—DEVELOPMENTAL DISEASES.																		
Puerperal diseases	165	112	49	4	29	10	8	7	11	10	19	26	40	5	49	49	67	---
Old age	41	---	41	---	---	---	1	1	15	13	8	---	---	3	12	10	11	8
V.—EXTERNAL CAUSES.																		
Suicide	135	108	20	7	---	---	---	5	23	32	23	25	17	10	9	33	75	18
Heat, death from—sunstroke	1	1	---	---	---	---	---	---	---	---	---	---	---	1	---	---	1	---
All other causes not classified	2,545	1,608	696	241	296	103	51	89	228	283	300	305	414	476	708	474	1,000	303
Stillbirths	296	176	80	10	---	---	---	---	---	---	---	---	---	---	296	---	---	---
Totals	9,742	5,602	3,373	767	1,427	827	364	446	1,003	995	1,153	1,001	1,372	888	3,720	1,863	3,233	936



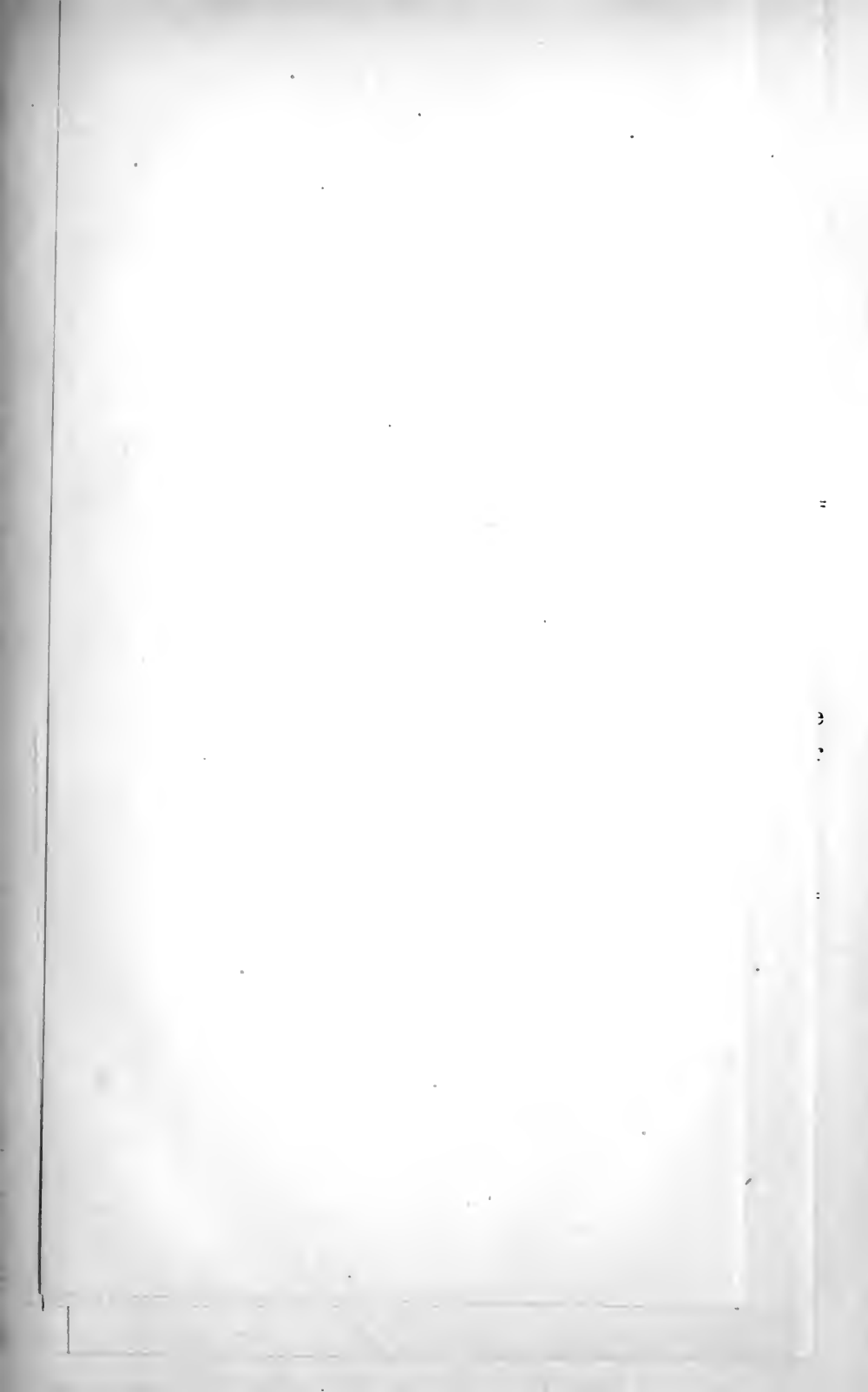


TABLE No. 1.

Number of Deaths, arranged according to Series, Months, and Ages, from June 30, 1884, to June 30, 1885.

LOCALITIES.	Total	SEXES.		MONTHS.												AGES.										Number of Months Reported.	Names of Correspondents.	
		Female.	Unknown.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Under 1 year.	1 to 5 years.	5 to 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	60 to 70 years.	Unknown.			
Anador	3		1							2	1		0			1	1									3	Dr. T. H. Mayes.	
Angel's Camp.	17	12	5								3	5	1			3	1	0	0	0	2	1	1	4	6	6	Dr. J. E. S. Baker.	
Anderson.	11	4	7	11												12	12	0	1	1	1	1	0	3	4	Dr. S. P. Gibson.		
Arbuckle	3	3														2	2	0	0	0	0	0	0	0	0	2	Dr. C. H. Tolson.	
Azuza	3	3														0	0	0	0	0	0	0	0	0	0	10	Dr. Samuel McOrdy.	
Auburn	34	14	10	7					0	7	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	13	Dr. C. A. Rogers.	
Bakersfield	1	1														0	0	0	0	0	0	0	0	0	0	0	Dr. E. C. Rhodes.	
Bartlett Springs	1	1														1	1	0	0	0	0	0	0	0	0	0	Dr. V. Newmark.	
Benicia	1	1														1	1	0	0	0	0	0	0	0	0	2	Dr. F. H. Payne.	
Berkeley	32	3	29	11							3	3	0	1	2	1	1	0	0	0	0	0	0	0	0	1	Dr. O. C. Hawkins.	
Biggs	5	3	1								1					0	0	0	0	0	0	0	0	0	0	1	Dr. D. Walker.	
Bodie	5	3	2													0	1	0	0	0	0	0	0	0	0	3	Dr. J. H. Johnson.	
Calico	5	3	2													0	1	0	0	0	0	0	0	0	0	3	Dr. J. Parker.	
Castroville	5	1	4								1	1				0	0	0	0	0	0	0	0	0	0	1	Dr. C. C. Mason.	
Chico	42	3	39		13	6				16	12	7	4			12	7	4	8	12	1	9	7	18	0	19	Dr. A. Fouch.	
College City	7	6	1													1	0	0	0	0	0	0	0	0	0	2	Dr. J. C. Smith.	
Cottonwood	19	12	7								15	1	0	1	1	1	0	0	0	1	0	0	1	1	15	5	Dr. J. W. Robertson.	
Crescent City	1															0	0	0	0	0	0	0	0	0	0	7	Dr. A. Truitt.	
Dixon	17	4	13	11		2	3	3		1	2					2	3	1	1	2	0	1	1	1	1	10	Dr. Aleney Jump.	
Downsville	4	3	1								1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	Dr. M. M. Cook.	
Durham	4	1	1								1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	Dr. J. A. McKee.	
Elk Grove	1	1									2	0				0	0	0	0	0	0	0	0	0	0	1	Dr. F. Durant.	
Folsom	2	1	1								0					0	0	0	0	0	0	0	0	0	0	0	Dr. Paul Reedy.	
Forest Hill	8	1	3	4						1	0	0				0	0	0	0	0	0	0	0	0	0	3	Dr. T. V. Goodspeed.	
Galt	10	3	4	1						1	0	0				0	0	0	0	0	0	0	0	0	0	1	Dr. C. A. E. Hertel.	
Gonzales	40	24	15	1		8	6	4		1	2	2	1	3	1	0	0	0	0	0	0	0	0	0	0	18	Dr. W. J. Jones.	
Grass Valley	22	12	9	1						3	3	4	4	2	1	0	4	4	9	2	2	2	2	2	0	9	Dr. J. A. Davidson.	
Hanford	28	10	10							3	0	4	4	4	1	0	1	0	0	0	0	0	0	0	0	7	Dr. J. G. Cooper.	
Haywards	3	2	1							1	2	1				0	0	0	0	0	0	0	0	0	0	2	Dr. J. B. Colman.	
Headburg	6	1	1							3	1					0	2	0	3	0	0	0	0	0	0	1	Dr. C. E. Miller.	
Hill's Ferry	9	4	4	1						0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	7	Dr. E. B. Robertson.	
Jackson	2	1	1							2	2	0				0	0	0	0	0	0	0	0	0	0	0	Dr. J. N. Moss.	
Jolon	14	7	7							2	6	3				3	4	3	0	2	1	0	2	0	0	4	Dr. J. N. Moss.	
Livermore	14	7	7							2	6	3				3	4	3	0	2	1	0	2	0	0	4	Dr. J. N. Moss.	
Lodi	34	10	11	13	35	23			34	27	48	33	37	32	39	32	29	29	47	18	28	17	15	10	10	Dr. F. W. Volman.		
Mariposa	55	34	12	9	7	10	9			9	9	9	37	31	2	9	1	0	0	8	2	4	10	2	28	7	Dr. David Powell.	
Merced	10	2	2	10						3	4	3	0			0	0	0	0	0	0	0	0	0	0	2	Dr. W. T. Bell.	
Millville	4	1	1													0	1	0	0	0	0	0	0	0	0	1	Dr. H. N. Rucker.	
Modesto	40	30	6	4						9	7	7	7	7	6	4	2	1	0	0	0	0	0	0	0	6	Dr. A. A. Graham.	
Monterey	20	12	8							2	5	3	3	2	2	0	0	0	0	0	0	0	0	0	0	4	Dr. C. W. Evans.	
Napa	53	34	17	2					10	7	9					0	1	1	3	6	3	4	8	5	2	11	Dr. A. Westall.	
Nevada City	7	3	2							3	6	6	6	11	13	2	5	3	0	3	5	2	4	6	8	11	8	Dr. M. S. Barker.
Newcastle	6	3	2							2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	Dr. M. Schabel.	
Nicolas	2	1	1							0	0					1	1	0	0	0	0	0	0	0	0	1	Dr. Z. T. Magill.	
Nordhoff	475	269	206		40	41	50	42	40	47	48	43	58	37	29	10	104	50	15	29	45	52	68	46	95	0	122	Dr. Ira Perry.
Oakland	6	0	0							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	Dr. E. W. Buck.
Ontario	5	4	1							5						0	0	0	0	0	0	0	0	0	0	0	7	Dr. E. Charley.
Oroville	9	7	2			3	3	3								2	0	0	0	0	0	0	0	0	0	0	1	Dr. Karstner.
Pasadena	15	2	12													0	0	0	0	0	0	0	0	0	0	0	6	Dr. F. C. Sheldon.
Paso Robles	54	30	14	10	3	1	15	10	1	3	5	5	6	1	4	2	3	4	2	3	3	3	1	6	24	12	Dr. E. E. Barner.	
Petaluma	48	20	5	13						1	3	5	13		13	10	0	2	0	0	0	0	0	0	0	37	5	Dr. J. H. Crane.
Placerville	10	2	3	5						5	5	2	2	1			0	0	0	0	0	0	0	0	0	5	4	Dr. G. W. Westlake.
Red Bluff	20	17	3							0	1					0	1	0	0	0	0	0	0	0	0	3	6	Dr. J. H. Miller.
Reading	5	2	1	2						0	1					0	0	0	0	0	0	0	0	0	0	0	3	Dr. A. W. Gamble.
Redwood City	6	4	2								1	2	3	0			0	0	0	0	0	0	0	0	0	0	0	Dr. H. E. Stafford.
Rocklin	220	117	103		30				33	37	39	31	25	25	30	32	15	3	7	31	19	24	31	25	30	7	Dr. Board of Health.	
Sacramento	18	7	11		5					13	0					0	0	0	0	0	0	0	0	0	0	0	12	Dr. E. Charley.
San Bernardino County	79	61	18		0	6	4	1	5	5	9	11	6	3	5	6	2	1	11	7	8	15	9	9	12	16	Dr. G. W. Barnes.	
San Diego	3,282	2,005	1,277		452	349	394	340	379	440	438	468	562	458	512	516	228	189	181	585	740	642	549	805	46	36	Dr. J. L. Meares.	
San Francisco	179	81	98							16	3	0	2	1	0	0	2	0	3	0	0	0	0	0	0	4	Dr. T. R. Goodspeed.	
San Jose	8	1	6							1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	Dr. J. A. Crane.	
San Mateo	29	20	8							9	5	1	2	1	4	4	7	3	0	2	3	1	3	3	1	6	Dr. S. Anderson.	
Santa Ana	37	17	18							6	9	10	3	2	3	1	3	8	1	1	1	1	8	1	1	4	Dr. Ch	

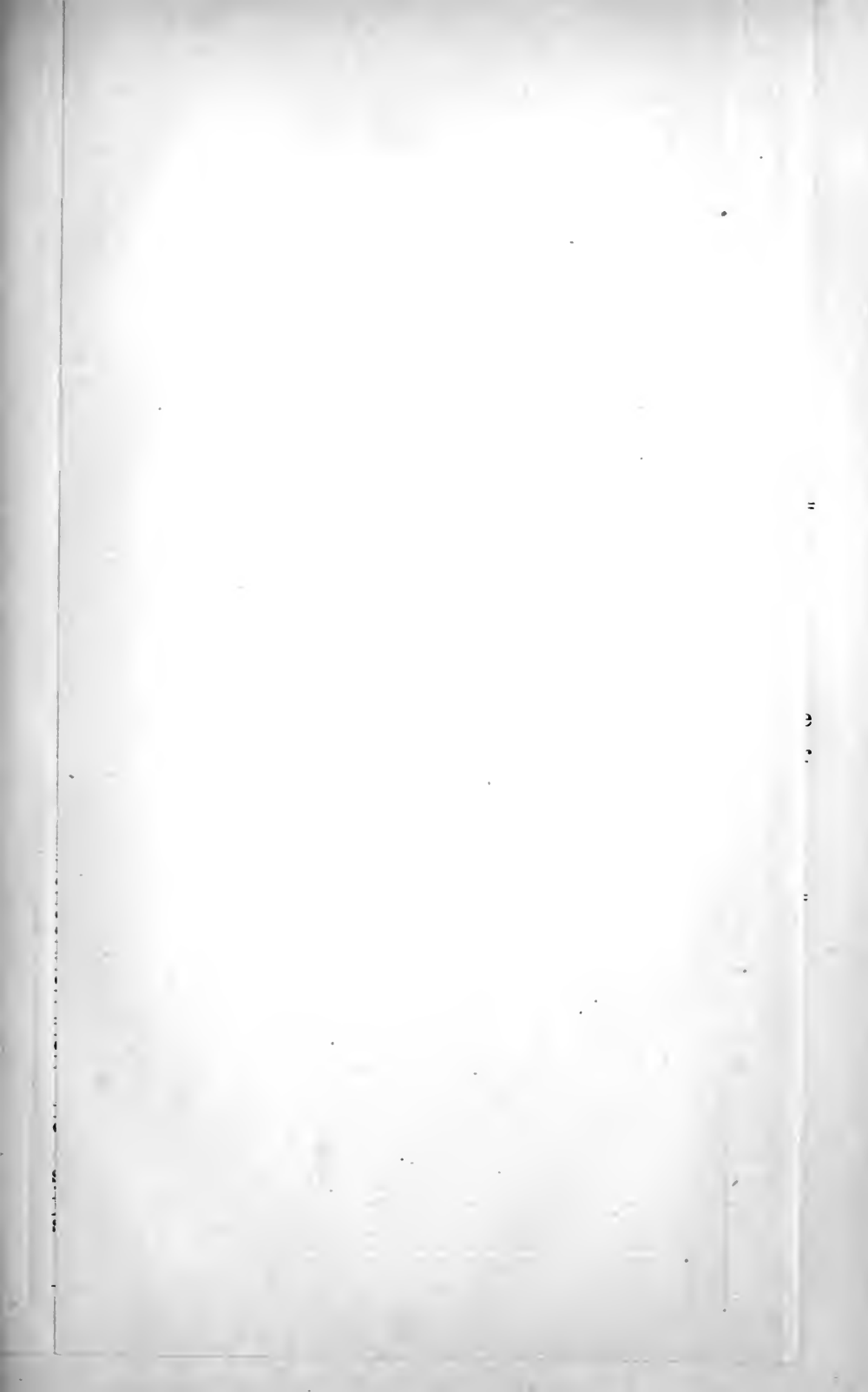


TABLE No. 2.

Number of Deaths from all causes, with the Sexes, Months, Ages, and Nativities, from June 30, 1884, to June 30, 1885.

DISEASES.	Total.	SEXES.		MONTHS.												AGES.										NATIVITIES.						
		Male.	Female.	Unsexed.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Under 1 year.	1 to 5 years.	5 to 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	60 to 100 years.	Unsexed.	Pacific States.	Atlantic States.	Foreign.	Unsexed.		
I.—ZYMOTIC OR EPIDEMIC.																																
Cholera morbus	14	4	8	2	2	3	2	0	0	0	0	0	0	3	1	3	6	31	1	2	2	1	1	2	8	3	2	1	2	1	2	
Cholera infantum	153	75	56	22	26	16	16	10	5	8	12	5	4	10	20	21	108	31	1	1	1	1	1	12	140	7	3	3	3	3	3	
Diarrhœa	95	57	34	3	3	11	7	3	9	5	2	5	4	8	5	13	8	10	13	2	1	1	1	10	8	33	9	21	21	28		
Dysentery	63	10	16	1	1	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Smallpox	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3	79	3	2	1	1	1	
Measles	84	31	45	8	3	9	0	0	0	0	3	2	7	5	6	27	31	26	34	5	0	0	2	1	1	13	79	3	2	1	1	1
Scarlatina	69	26	18	16	2	0	1	4	2	1	25	2	11	0	5	2	35	11	3	3	3	1	1	1	19	49	13	34	10	10	10	
Diphtheria	235	131	118	16	12	15	13	6	8	12	21	10	36	41	40	51	9	112	103	24	3	3	1	1	1	10	208	13	34	10	20	0
Croup	136	61	69	6	4	2	6	11	5	12	19	18	13	5	27	11	18	58	29	6	0	0	0	0	0	0	0	0	0	0	0	0
Influenza	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Whooping-cough	23	19	4	3	0	0	0	2	0	0	1	5	4	2	2	4	12	7	1	2	1	1	1	1	4	20	1	6	6	6	6	
Fever—Typho-malarial	11	9	2	0	0	6	2	0	0	0	0	0	1	0	0	0	2	1	2	1	1	1	1	1	4	4	1	6	6	6	6	
Typhoid	222	119	89	14	19	10	10	20	14	28	25	22	15	23	22	14	13	15	44	56	34	18	18	10	14	85	40	19	91	6	6	
Remittent and intermittent	60	32	20	8	6	6	4	6	1	2	9	7	8	2	3	6	3	6	10	3	7	13	7	4	1	6	19	19	19	3	3	3
Cerebro-spinal	73	40	27	6	13	3	6	1	3	6	7	4	4	1	8	6	9	24	16	6	7	7	2	2	1	11	5	7	7	7	7	
Erysipelas	23	9	13	1	1	1	2	1	2	2	1	0	1	1	2	0	3	2	6	2	2	2	2	2	2	8	3	7	7	7	7	
Syphilis	17	15	2	4	0	0	2	2	3	6	1	0	1	1	1	2	1	4	2	2	5	6	3	2	1	7	3	7	7	7	7	
Alcoholism	111	73	27	11	6	8	4	9	6	9	15	11	6	13	9	15	15	15	12	24	34	18	12	11	25	29	55	55	2	2	2	
II.—CONSTITUTIONAL DISEASES.																																
Hydrocephalus	44	28	16	4	4	3	7	2	4	3	5	3	2	4	3	4	17	19	4	3	1	1	1	1	39	4	1	23	33	33	33	
Meningitis	219	110	99	5	28	14	2	21	0	13	24	14	21	21	22	34	53	68	26	7	9	9	7	5	6	14	143	15	2	46	46	
Phthisis pulmonalis	1,227	718	424	85	74	57	72	58	113	107	136	139	133	125	113	99	8	12	103	270	304	201	117	81	119	254	343	564	33	33	33	
Marasmus	249	145	121	3	20	23	18	21	15	20	23	18	23	11	3	2	10	7	3	5	8	4	1	1	1	217	10	4	33	9	9	
Serofula	12	7	5	1	2	1	1	1	1	0	1	1	2	0	1	1	1	1	1	1	2	2	2	2	2	8	3	3	9	9	9	
Rheumatism	20	10	10	0	1	1	3	2	4	2	2	1	4	2	0	1	1	1	1	1	1	1	1	1	1	8	3	9	9	9	9	
Cancer	208	102	98	8	24	15	14	16	6	15	22	18	20	18	19	21	21	21	11	11	28	50	55	57	6	11	53	113	113	31	31	31
III.—LOCAL DISEASES.																																
Pneumonia	552	337	183	32	38	21	21	25	31	39	67	70	79	51	55	64	76	72	34	22	44	58	75	51	72	46	224	113	193	17	17	17
Pleurisy	17	15	2	4	1	1	0	2	1	0	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	5	9	9	9	9	
Bronchitis	181	104	73	4	14	11	4	7	7	17	19	18	32	14	24	14	45	37	4	2	13	17	11	10	34	8	90	14	76	71	71	
Other diseases of respiratory organs	154	104	43	5	13	17	7	9	8	8	12	24	16	11	7	22	24	13	2	4	16	20	33	19	15	11	40	24	81	37	37	
Enteritis	135	72	63	15	9	7	5	9	10	17	11	9	15	12	16	70	15	2	7	3	8	9	10	11	11	88	5	9	25	25	25	
Gastritis	36	19	17	0	0	0	8	5	7	2	2	5	1	2	1	3	1	1	1	1	5	8	5	9	2	4	9	3	9	9	9	
Gastro-enteritis	22	10	10	2	2	3	0	2	1	2	1	2	3	1	3	2	7	1	1	1	5	2	2	2	2	9	3	9	9	9	9	
Peritonitis (non-puerperal)	73	33	37	3	10	4	5	5	7	9	5	3	5	6	4	10	1	2	5	17	15	12	9	9	3	16	20	36	1	1	1	
Diseases of the liver	120	75	45	12	8	10	7	9	7	9	7	11	13	10	8	11	14	2	1	1	8	27	32	20	25	4	18	24	77	1	1	1
Other diseases of stomach and bowels	49	32	16	1	2	5	5	3	5	9	5	4	2	3	4	2	15	1	1	2	5	10	6	7	1	20	13	15	4	4	4	
Bright's diseases and nephritis	140	92	44	4	12	7	18	9	16	9	13	10	11	13	9	13	4	2	1	1	5	22	32	21	30	1	28	43	65	4	4	4
Aneurism	23	19	4	1	3	1	1	3	0	4	2	4	2	4	1	3	1	1	1	1	2	6	4	8	2	7	7	16	16	16	16	
Heart diseases	486	290	168	28	29	30	27	26	51	48	48	68	33	49	38	6	1	6	23	42	53	110	92	116	37	66	176	251	13	13	13	13
Convulsions	211	127	80	4	18	18	11	16	11	18	17	27	25	18	10	22	100	39	8	1	1	1	1	1	1	191	3	4	13	13	13	
Diseases of brain and nervous system	142	75	64	3	10	12	11	12	12	12	11	9	11	19	12	11	24	13	2	4	9	13	24	19	29	5	37	29	71	71	71	
IV.—DEVELOPMENTAL DISEASES.																																
Puerperal diseases	38	38	0	4	4	5	2	1	3	7	5	4	0	2	1	1	1	1	1	21	15	1	1	1	1	6	14	18	18	18	18	
Old age	140	82	52	6	4	9	6	7	15	16	14	16	17	16	13	6	6	6	1	1	137	2	1	1	1	9	47	75	9	9	9	
V.—EXTERNAL CAUSES.																																
Suicide	107	77	16	14	5	8	9	9	7	6	6	7	12	11	16	11	11	11	2	1	22	24	24	17	11	6	4	21	66	66	66	
Heat, death from—sunstroke	1,913	1,172	561	159	119	92	139	118	119	178	178	184	212	188	174	222	228	55	52	72	184	122	168	241	321	469	523	586	645	146	146	
All other causes not classified	294	142	133	19	22	22	22	22	21	28	21	25	24	27	21	38	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Stillbirths	294	142	133	19	22	22	22	22	21	28	21	25	24	27	21	38	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Total	8,298	4,741	3,002	495	592	475	513	506	524	670	827	730	809	762	818	877	1,211	709	323	371	837	855	923	787	1,031	870	3,242	1,757	2,794	445	445	



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TABLE No. 3

*Number of Deaths, arranged according to Sexes, Months, and Ages, from June 30, 1886, to June 30, 1886.*

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TABLE No. 4.

Number of Deaths from all causes, with the Sexes, Months, Ages, and Nativities, from June 30, 1885, to June 30, 1886.

DISEASES.	Total.	SEXES.		MONTHS.												AGES.										NATIVITIES.						
		Male.	Female.	Unascertained.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	Under 1 year.	1 to 5 years.	5 to 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	60 to 100 years.	Unascertained.	Pacific States.	Atlantic States.	European.	Unascertained.		
I.—ZYMOTIC, OR EPIDEMIC.																																
Cholera	18	8	7	3	3	1	1	5	1	0	0	0	1	1	3	3	2	2	3	1	1	5	8	3	4	3	6					
Cholera morbus	169	81	76	12	15	31	23	30	13	11	6	6	4	3	5	5	49	7	3	1	2	10	162	1	7	17						
Cholera infantum	77	46	25	4	3	3	6	13	6	3	2	3	0	1	3	2	10	3	1	1	3	3	15	4	19	1						
Diarrhoea	39	25	13	1	6	3	8	6	3	2	2	3	0	1	3	2	10	3	1	1	1	5	26	2	2	1						
Dysentery	31	11	16	4	10	4	3	1	1	2	2	2	2	1	2	4	8	12	1	2	1	3	26	2	2	1						
Smallpox	65	21	20	24	6	1	2	6	6	14	1	0	1	1	2	3	11	26	14	7	7	48	15	15	20							
Measles	374	185	108	20	35	24	34	37	30	47	27	19	25	31	31	18	15	182	123	42	2	3	314	25	15	20						
Scarlatina	165	90	63	13	15	5	11	13	19	25	20	14	19	9	13	3	20	87	30	5	1	22	149	6	5	5						
Diphtheria	2	1	1	1	1	1	1	1	3	6	2	3	3	1	3	3	3	1	1	2	3	2	45	4	2	2						
Croup	47	21	23	3	4	1	1	1	3	6	2	3	3	1	3	4	3	1	1	2	3	7	13	8	4	2						
Influenza	22	15	6	1	1	2	4	10	2	1	1	1	1	2	1	3	1	4	6	1	1	2	5	13	8	4	2					
Whooping-cough	32	12	6	14	3	8	1	4	2	1	1	1	1	2	1	3	3	4	4	6	1	1	13	5	67	25						
Erysipelas	225	125	78	22	15	20	24	38	22	12	14	16	13	17	14	20	1	14	19	39	56	25	21	17	1	3	23	13	10			
Fever—Typho-malarial	46	21	23	2	5	4	6	4	4	3	3	1	5	1	6	5	5	3	7	6	5	3	6	13	64	9	7	16	10			
Typhoid	94	37	38	21	7	6	9	6	4	10	7	5	0	12	10	5	1	3	1	2	2	5	1	2	4	4	6	10	10			
Remittent and intermittent	14	8	6	1	1	3	1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Cerebro-spinal	113	70	33	10	7	8	14	9	16	13	12	7	7	7	6	1	1	1	1	2	8	19	32	26	19	6	7	35	61	10		
Syphilis	113	70	33	10	7	8	14	9	16	13	12	7	7	7	6	1	1	1	1	2	8	19	32	26	19	6	7	35	61	10		
Alcoholism (direct or remote), including delirium tremens.	113	70	33	10	7	8	14	9	16	13	12	7	7	7	6	1	1	1	1	2	8	19	32	26	19	6	7	35	61	10		
II.—CONSTITUTIONAL DISEASES.																																
Hydrocephalus	53	34	17	2	2	5	3	2	5	5	6	8	2	4	3	8	22	22	7	1	1	16	18	7	8	5	47	4	2	16		
Meningitis	224	117	91	13	2	2	3	2	5	5	6	8	2	4	3	8	22	22	7	1	1	16	18	7	8	5	47	4	2	16		
Phthisis pulmonalis	1,540	871	472	177	113	92	123	113	140	173	145	150	132	121	116	9	14	9	126	415	291	267	165	113	131	303	437	597	213	16		
Marasmus	395	170	132	1	35	28	29	26	30	18	28	8	21	19	31	30	197	21	3	4	2	1	1	1	1	1	197	20	54	32		
Scrophulous	9	8	1	1	2	0	0	0	3	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Serofula	9	8	1	1	2	0	0	0	3	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Rheumatism	22	13	8	1	4	2	1	0	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Cancer	208	117	160	21	19	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	34	29	
III.—LOCAL DISEASES.																																
Pneumonia	604	350	210	35	50	31	45	38	46	70	100	52	55	45	44	28	106	91	8	28	56	68	64	62	92	29	257	107	208	32		
Pleurisy	16	11	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Bronchitis	194	108	71	12	9	10	13	14	18	23	32	42	16	15	6	64	7	3	4	12	9	15	21	33	26	9	25	65	23	17		
Other diseases of respiratory organs	115	71	39	8	7	12	8	13	11	12	16	7	11	5	5	11	23	99	17	1	8	3	17	15	5	13	8	59	25	23	6	
Enteritis	163	89	72	2	24	7	21	11	15	18	10	9	14	5	11	33	99	17	1	8	7	8	11	8	6	22	11	25	12	5		
Gastritis	70	34	25	11	5	8	8	8	6	5	5	2	5	8	5	5	14	5	2	2	1	1	1	1	1	1	1	1	1	1		
Gastro-enteritis	14	6	8	3	4	11	9	10	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Peritonitis (non-puerperal)	87	44	40	3	4	16	8	14	12	16	22	13	15	11	11	13	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
Diseases of the liver	47	25	17	5	5	6	4	5	4	2	4	2	4	2	4	2	4	2	4	2	5	24	45	31	35	3	12	25	101	9		
Other diseases of stomach and bowels	147	102	41	5	4	16	8	14	12	16	22	13	15	11	11	13	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
Bright's disease, and nephritis	134	85	43	6	7	10	10	15	15	10	9	11	10	8	11	18	1	3	2	6	12	17	24	35	3	15	48	13	3	11		
Aneurism	28	23	3	3	2	5	1	5	0	2	2	2	5	2	3	3	1	4	4	9	18	44	64	100	101	176	27	82	163	240	33	
Heart diseases	547	329	195	23	37	48	55	40	48	57	60	47	40	38	20	39	4	4	9	18	44	64	100	101	176	27	82	163	240	33		
Convulsions	246	126	116	6	22	23	19	26	21	23	11	23	20	21	18	154	67	5	8	7	11	10	29	26	40	5	22	49	67	20	20	
Other diseases of brain and nervous system	165	112	49	4	9	7	13	34	11	15	24	12	12	12	5	9	29	10	10	7	11	10	29	26	40	5	22	49	67	20	20	
IV.—DEVELOPMENTAL DISEASES.																																
Puerperal diseases	41	41	41	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Old age	192	78	93	18	16	12	15	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	
V.—EXTERNAL CAUSES.																																
Suicide	135	108	20	7	12	14	9	10	11	16	8	12	11	13	18	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
Heat, death from—sunstroke	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
All other causes not classified	2,545	1,408	695	241	189	204	195	203	174	228	233	193	239	216	247	221	293	103	51	80	228	283	300	305	414	476	708	474	1,000	343	343	
Stillbirths	236	176	80	10	28	24	30	27	27	28	35	25	22	20	32	30	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	
Totals	9,742	5,602	3,373	767	776	789	793	851	794	905	945	723	824	725	829	760	1,427	824	344	456	993	925	1,153	1,041	1,373	897	3,710	1,803	3,233	936	936	

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# APPENDIX.

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The Board of Health, while generally approving the papers presented in this report, are not responsible for the particular sentiments expressed.

BOARD OF HEALTH.

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# THE CLIMATOLOGY AND DISEASES OF SOUTHERN CALIFORNIA.

By H. S. ORME, M.D., President State Board of Health.

## TOPOGRAPHY.

The territory to which this inquiry is restricted embraces the Counties of Santa Barbara, Ventura, Los Angeles, San Bernardino, and San Diego.

It comprises an irregular outline extending about from latitude  $32^{\circ} 30'$  to  $35^{\circ} 40'$  and from longitude  $37^{\circ}$  to  $43^{\circ} 40'$ . In the direction of the parallels its extreme width is three hundred and thirty miles, and its extreme length two hundred and thirty miles. Its coast line, following the indentations, measures about three hundred and thirty miles.

Four of the five counties have a wide exposure to the sea; and but one of the five, viz.: San Bernardino, is entirely inland. Two thirds of the coast line of Santa Barbara County, and about one half of that of Los Angeles County, presents a southerly exposure. The remaining portion of the entire coast line faces westerly or southwesterly. Between the most easterly point on the coast and the most westerly there is a distance of two hundred and fifteen miles.

The western part of this region is traversed by low ranges of mountains, having an average altitude of from three thousand five hundred to six thousand feet. A few of the higher peaks exceed seven thousand feet in altitude; the culminating peak, Mount San Bernardino, reaches to a height of eleven thousand eight hundred feet above the sea level. These mountain ranges inclose a number of small but fertile valleys, a few of which are settled. All of them are capable of supporting a population of moderate density.

The eastern portion consists of an arid and tolerable level tract, usually called the Mohave Desert. A small portion of this in the extreme southern part of the State is known as the Colorado Desert. It is separated from the former by a few isolated ridges which form the southern remnant of the San Bernardino Mountains. The western part of this arid region has an altitude of two thousand feet, the central and eastern parts are much lower, and in several places are below the sea level. Two of these depressions, Death Valley, and the sink of the San Felipe River, are about four hundred feet below the sea.

The lowest point on the Southern Pacific Railroad through the Colorado Desert is twenty-six miles east of Indio, or five miles west of Dos Palmas; this is two hundred and sixty-six feet below the sea level. From this point the ground falls off south, until reaching a point half a mile distant, the level bottom of the desert in the form of a salt bed is found; this is two hundred and eighty feet below the sea. This is where the "New Liverpool" salt company are operating, and have their works.

But by far the most important part of Southern California is the western slope of the Coast Range of mountains, which, from a narrow strip in the north, widens to a broad plain in the south.

Its area is materially increased also by the valleys of numerous short rivers which traverse the mountain ranges, and flow towards the ocean. This region is possessed of wonderful fertility, and is capable of supporting a denser population than any other part of California. The conditions of soil and climate are such, that it will produce almost any crop that can be grown between the latitudes of Lake Manitoba and Key West.

It is this region which we shall chiefly consider in speaking of Southern California. Its hoard of grain already contributes to feed the overcrowded population of London: its preserved fruits are sold in the cities of Southern Italy.

#### SOIL.

There are many varieties of soil to be found in the southern counties of California. These in their bearing upon the climate of the region may be classified with respect to their retentiveness of moisture. The non-retentive soil includes the red and blue clays, of which there are but little, and the well known *adobe*. The latter is more or less abundant, occurring in irregular patches from a few acres to several square miles in extent.

The retentive soils comprise the gravelly loams, the micaceous sediments, and the so called sand bottoms along the river courses. This classification may seem at first paradoxical, but facts are stronger than theory, for while the wet and boggy clay and adobe bakes under a semi-tropical sun into a friable and *perfectly dry mass*, the sands and more porous soils are *moist* throughout the year. This peculiarity, which is due to capillarity, is not only an important element in insuring great productivity to the soil, but it also exerts a decided effect in moderating the severity of the Summer's heat. The soil of the eastern part, or the arid region, and also the detritus brought down by the rivers during the Winter floods, is commonly called "sand." Of true sand, however, there is not a particle, excepting along the coast. The alleged "sand" is nothing more than disintegrated granite rock, rich in feldspar, and containing a notable quantity of mineral phosphates.

This is the secret of the wonderful productiveness of the soil wherever watered; it is also a most important factor in determining the fine quality of the fruit and vintage, for which Southern California has already a world-wide reputation.

#### HUMIDITY.

Under this head we will consider the annual rainfall, and independently the amount of moisture present in the atmosphere. A knowledge of the total rainfall of a region gives but little insight as to its climatic conditions; the distribution of the rainfall reveals much. In Southern California, as on the Pacific Coast generally, the rainfall occurs almost wholly during the Winter months. A few scattering showers occur in November and December; heavier rains fall during the following three months, especially during February and March. There are occasional rains in April, and rarely in May. In the mountains, however, there are at times heavy mists, and even dashes of rain.

The average rainfall of the southern part of the State may be seen from the following table. Of the five stations mentioned, Santa Barbara and San Diego are on the coast; Los Angeles is about seventeen miles inland. San Bernardino, about sixty miles inland. Yuma is situated in the heart of the arid basin region, the town is just over the line in Arizona (old Fort Yuma is in California).



STATION.	Average Rainfall in inches.
Santa Barbara	15.8
Los Angeles	17.6
San Diego	10.6
San Bernardino	15.9
Yuma	2.3

In general the rainfall of the western part of Southern California is sufficient to produce as much as the soil will stand without "wearing out." This on the average will hold good six years in seven. In the eastern region, wherever water can be obtained for irrigation, vegetation grows with wonderful luxuriance, as may be seen in the case of the railway station at Indio, in the Colorado Desert. Without artificial irrigation, scarcely anything beyond a few species of cactus and agave will grow.

From the preceding it will be seen that the habitable portions of Southern California receive but a trifle less of rain than the lower Sacramento Valley, and considerably more than the San Joaquin Valley.\*

A more important factor than the rainfall, is the relative humidity of the air. This is a matter somewhat difficult to present, as the atmosphere may be extremely "moist" one day, and very "dry" on another, and yet in both cases contain exactly the same amount of aqueous vapor. The cause, it is hardly necessary to state, is due to a difference in temperature. In the one case the air, because of its low temperature, contains nearly or quite all the vapor it can possibly hold. In the second case, while the air may contain the same amount or even more of moisture, the air seems dry, because its high temperature enables it to hold three or four times as much vapor as it appears to contain. In Southern California the seasons of dry air and moist air are well marked. Aside from these there are belts of country especially liable to heavy fogs.

From the time of the first rains, the belt of country next the coast is bathed in an atmosphere which is tolerably moist. At a distance of a few miles inland the relative humidity increases—not because there is more moisture but because the temperature is apt to range lower. Here the fogs are heaviest and the deposition of dew is greatest. Beyond this belt as the distance from the coast increases, the relative humidity decreases, until, at the crest which separates the Pacific Slope from the Great Basin, the air throughout the year is dry, pure, and invigorating. During the Summer months the relative humidity is much less than in Winter. The deposition of dew ceases altogether, and the atmosphere becomes very dry. There is no decomposition of organic matter, because there are no Summer rains. As a result, the atmosphere is so pure and free from organic germs, that meat exposed to the air cures or "jerks," but does not putrify. In the Colorado Desert, and even in the high mesa lands west of the divide, culture fluids, such as are used in cultivating bacteria, if properly sterilized, often evaporate without "breaking down." It must be borne in mind, however, that this condition, although a prevalent one, is by no means universal. There are many days during the rainy season when the atmosphere is damp, chilly, and depressing. There may also be occasional localities where on account of excessive irrigation and imperfect drainage, etc., the atmosphere is liable to be unwholesome, and malarial diseases might prevail. Damp and chilly days, however, are rare even in Winter,

\* Sacramento, 19.7 inches; Stockton, 16.7 inches; Visalia, 9 inches.

and the few localities (which are not properly drained) where malaria might prevail can be readily avoided.

#### WINDS.

The prevailing winds of this region are generally called "trade winds." This name may answer for want of a better one, but, as a matter of fact, the upper and prevailing currents of air have more the nature of monsoons than of trade winds. During the Winter months the prevailing winds are from the south and southwest; during the Summer months, from the north and northwest. As a general thing, local winds assert themselves all over this part of the State, and, in fact, throughout the Pacific Coast. Thus along the coast the land and sea breezes are nearly always to be found. They are very noticeable at Santa Barbara, Santa Monica, and San Pedro, perhaps less so at San Diego. During very hot days in the interior, a stiff sea breeze all along the coast blows inland to replace the rising current of hot air. As a result, there is not only cool weather along the coast, but the temperature of the inland belt is considerably modified. This is shown in comparing the temperature of the region west of the great divide with that east of it. In the former the temperature rarely reaches 90° Fahrenheit, while in the latter it frequently ranges from 115° to 125° for days at a time.

Another health-giving, but extremely disagreeable wind, is the "Santa Ana," or "norther." This is a hot and very dry wind, usually confined to limited localities a few miles inland, but occasionally sweeping over a broad belt of country. During the progress of this wind the air is highly electrified. Horses' tails stand out like thick bushes, the hair of the head crackles sharply when rubbed with the hand, and metallic bodies resting on an insulating material, such as dry wood, discharge themselves with visible sparks when a conductor is brought near. In one instance, it is said, the telegraph line between Los Angeles and Tucson, some four hundred and fifty miles in length, was detached from the battery and operated by the earth currents alone. After the clearing away of one of these wind storms, the atmosphere becomes wonderfully clear, pure, and invigorating.

In general, the direction of the local winds of the interior is governed, to a great extent, by the direction of the mountain ranges and the various passes. Thus the "Santa Ana" wind receives its name, because it frequently issues from the Santa Ana Pass.

#### TEMPERATURE.

The mild and genial temperature to which Southern California owes its celebrity is due to two causes—low latitude and ocean winds. Lying in the latitude of South Carolina and Georgia, warmth would necessarily result from the nearly vertical rays of the sun. But while the latter States are swept chiefly by land-winds, the former is perpetually swathed in winds that have been warmed by tropical waters. The climate has, therefore, the features of an ocean climate; that of the coast region is typically oceanic, and this is the secret of its uniformity. It is hardly necessary to state that the temperature is most uniform along the coast, and that the daily range increases as one travels from the coast towards the interior.

As an instance of the mildness of the coast climate the average of the twelve hottest and twelve coldest days at Santa Barbara are respectively 81° and 62°. The highest reading for this year, which is taken at random, is 92°; the lowest 42°. The result would have been materially the same if San Diego, Long Beach, or Santa Monica had been taken as an example.

The following table shows the mean temperature of the principal localities of Southern California for a period covering four years. There would have been no material difference had the period been extended to ten years:

STATION.	Mean Temp., June, July, and August.	Mean Temp., Dec., Jan., and Feb.
Santa Barbara.....	74.2	57.6
Los Angeles.....	66.1	50.0
San Diego.....	66.3	53.1
San Bernardino.....	69.0	49.0
Yuma.....	87.1	54.8

At Los Angeles, during the year 1880, the thermometer rose as high as 90° only fourteen times, while at San Diego this temperature was recorded only six times.

East of the divide which separates the Great Basin from the Pacific Slope, the heat of Summer becomes exceedingly fierce. A temperature of 135° has been recorded in the Colorado Desert, and one of 120° is by no means uncommon. At Yuma, during the year 1880, there were one hundred and eighteen days in which the temperature exceeded 100°, and twenty-eight days in which it exceeded 110°. At Indio and Dos Palmas, two stations on the Southern Pacific Railroad, the heat has been even more severe.

It is worthy of remark, however, that in this region, such high temperature is by no means intolerable. Because of the dryness of the atmosphere, there is no greater discomfort with the thermometer at 120°, than in New York or in Chicago at 95°. Sunstroke is almost unknown, and people who live in this locality remain out of doors unconcernedly, the thermometer meanwhile indicating a temperature which, in a region of Summer rains, would almost depopulate it by sunstroke.

In the western part of Southern California, frosts are rare, and are confined to the river bottoms, and the high mountain altitudes. There are extensive belts of land where they never occur. Tropical fruits and exotic plants may suffer from drought, but not from cold.

It is also worthy of remark that, although the Summer days may be unpleasantly warm, the nights are invariably cool. Flannel may and should always be worn next the skin throughout the year, and there are not half a dozen days in the year when light woolen outer garments are uncomfortable.

#### DISEASES.

In order to obtain reliable data on which to base a satisfactory report upon the prevalent diseases of this section, a circular letter was directed to numerous reputable resident practitioners, asking for information on this point limited to the years 1884 and 1885. Of those addressed fifty-one responded in detail.

To make the individual reports complete very many personal communications were necessitated, the resulting correspondence becoming quite voluminous. I desire here officially, as I have privately by letter, to express my gratitude to the many busy physicians who so fully responded to my inquiries, and thus made this report possible. Especially am I indebted to Dr. F. A. Seymour of Los Angeles for valuable counsel and assistance.

After repeated careful examination and comparison of these replies, it

has seemed best to present a condensed tabulated summary, in which the relative frequency of the several diseases reported shall be expressed by words instead of numbers. The following reasons among others have led to this decision: First, the fact that most of the reporters have quoted from memory. Second, a numerical report to be of value must include a memorandum of the total population among whom the reporter has practiced, and his total number of cases of all kinds, in the period named as well. Without these figures for purposes of comparison a numerical statement must be misleading. Third, the words here employed to describe the results of professional observation are such as must convey to the general reader a more satisfactory idea of the facts than ever figures could do.

Inasmuch as certain reporters may notice that the tabulated statement varies somewhat from their reports, it is but right that the rules should be stated upon which the final summary was based:

*First*—Where there was but one report from any locality, the facts were recorded without change.

*Second*—Where from any locality some reported a disease frequent, and others absent, in the table it will be found *occasional*.

*Third*—When some reported rare, and others occasional, *occasional* was adopted.

*Fourth*—Where some reported rare, and others absent, *very rare* is used.

*Fifth*—Where some reported occasional, and others absent, *rare* is employed.

These rules have been departed from to the least possible degree, and only where a wide discrepancy has been noticeable between the report of an old resident practitioner and of a comparatively recent arrival. Before giving the table it may not be amiss to present concisely a few topographical facts pertaining to the several localities reported, and in the order in which they appear.

**SANTA BARBARA.**—On the coast. Exposure, southerly. Sheltered by mountains to northward.

**SANTA MARIA.**—Thirteen miles inland. Elevation, about three hundred feet. Surrounded by mountains, but not sheltered from trade winds. Prevailing winds west and northwest.

**LOS ALAMOS.**—Thirty-five miles inland. Elevation, five hundred feet. Sheltered by mountains; but the valley runs into other valleys which open out to the ocean. Prevailing wind northwest.

**SAN BUENAVENTURA.**—On the coast. Exposure, southwesterly.

**NORDHOFF.**—About fifteen miles inland. Elevation, about fifteen hundred feet. An upland valley (Ojai), surrounded by mountains, sheltered from ocean winds and fogs.

**SANTA MONICA.**—On the coast. Exposure, southwesterly. Sheltered by a low range of mountains to northward.

**WILMINGTON AND SAN PEDRO.**—On the bay. Southerly and easterly exposure. Sheltered somewhat from westerly winds by the peninsula.

**COMPTON.**—Twelve miles inland. Elevation, about eighty feet. In the artesian belt of wet lands. Sheltered by a low range of hills on the northwest and south. Exposed to westerly winds.

**DOWNEY.**—Fourteen miles inland, on the San Gabriel River. Elevation, about one hundred and twelve feet. Exposed to westerly winds.

**FULTON WELLS (or IRON SULPHUR SPRINGS, a health resort).**—About fourteen miles inland. Elevation, about one hundred and fifty feet. On the eastern margin of the artesian belt, on a mesa approaching a low range of hills to the eastward. Winds from the southwest, never heavy.

**ANAHEIM.**—Twelve miles inland. Elevation, one hundred and thirty-three

feet. On the south bank of the Santa Ana River. Sheltered on the north and east by a low range of hills and exposed to the ocean breeze on the south and west.

**SANTA ANA.**—Ten miles inland. Elevation, about one hundred and forty feet. In an open valley. Sheltered on the north and east by a low range of hills. Exposed to mild ocean winds from the south and west.

**ORANGE.**—Twelve miles inland. Elevation, about one hundred and forty feet. In an open valley, sheltered on the north and east by the Santiago Mountains, and exposed to mild ocean winds from the south and west.

**POMONA.**—About thirty miles inland. Elevation, about eight hundred and fifty-five feet. In the San José Valley. Sheltered on the west by the San José hills and on the north by the Sierra Madre Mountains. An open plain to the east. Prevailing winds from the south and west: never harsh.

**AZUSA.**—Thirty-five miles from the coast. Elevation, about five hundred feet. An agricultural settlement near the foot-slope of the Sierra Madre Mountains. Exposed to mild southwest winds.

**PASADENA.**—About twenty-eight miles inland. Elevation, about one thousand feet. On the foot-slope of the Sierra Madre Mountains. Sheltered on the west by a low range of hills, on the north by the Sierra Madre, and exposed on the south and west to a temperate ocean breeze.

**SAN FERNANDO.**—Twenty-five miles inland. Elevation, one thousand and sixty-seven feet. A large open valley, sheltered on the south and west by a low range of hills, on the north by the Sierra Madre Mountains. Prevailing winds from the south.

**NEWHALL.**—About thirty-five miles inland. Elevation, twelve hundred feet. On the north slope of the Sierra Madre Mountains, at the head of the Santa Clara Valley, surrounded by mountains on the south, west, and east. Prevailing wind from the southeast. Oil region.

**LOS ANGELES.**—Seventeen miles inland. Elevation, from two hundred and fifty to four hundred and fifty feet. Open approach from the ocean from the south and west. Sheltered on the north by the foothills of the Coast Range, and on the east by the Sierra Madre Mountains. Prevailing winds from the south and west.

**SAN BERNARDINO.**—About sixty miles inland. Elevation, one thousand and seventy-three feet. Surrounded on the north and east by the San Bernardino Mountains, on the south by the San Jacinto and Temecula Mountains. Artesian section. Exposure to westerly winds.

**COLTON.**—About fifty-five miles inland. Elevation, nine hundred and seventy-two feet. Surroundings practically the same as those of San Bernardino, which is but four miles distant.

**RIVERSIDE.**—About fifty miles inland. Elevation, nine hundred and fifty-five feet. On the south bank of the Santa Ana River. Exposed to the same winds as San Bernardino and Colton, and to the winds from the Cajon Pass and Santa Ana Cañon.

**CALICO.**—One hundred and twenty miles inland. Elevation, twenty-two hundred feet. On the north side of the Sierra Madre Mountains, and surrounded on the north and west by a low range of mountains. In the Mojave Desert. Prevailing winds from the north and west.

**SAN DIEGO.**—On the main shore of a land-locked bay. Sheltered from heavy trade winds, and exposed only to moderate winds from the west.

**NATIONAL CITY.**—Similarly situated and but four miles distant from San Diego.

**VALLEY CENTER.**—About twenty miles from the coast, in a small inland valley (Bear Valley). Elevation, about two hundred feet.

## A TABULATED PRESENTATION

Of the various Diseases met with in Southern California during 1884-85.

ABBREVIATIONS:—A, Aseptic; R, Rare; V R, Very Rare; O, Occasional; F, Frequent.

	SANTA BARBARA COUNTY.			VENTURA COUNTY.	LOS ANGELES COUNTY.												SAN BERNARDINO COUNTY.		SAN DIEGO COUNTY.					
	Los Alamos	Santa Maria	Santa Barbara	San Buenaventura	Nordhoff	Santa Monica	Wilmington and San Pedro	Compton	Downey	Fulton Wells	Anaheim	Santa Ana	Orange	Pomona	Azusa	Pasadena	San Fernando and Newhall	Los Angeles	San Bernardino	Riverside	Colton	Calico	San Diego and National City	Valley Centre
—THOSE DEPENDENT UPON, OR IN ANY WAY MODIFIED BY CLIMATIC INFLUENCES.																								
GENERAL DISEASES.																								
a. Diathetic.																								
1. Rheumatism	R	F	F	F	R	O	O	R	O	A	O	R	R	R	O	R	E	R	O	O	O	R	O	O
b. Malarial Affections.																								
1. Intermittent fever	A	A	A	A	A	A	O	O	O	A	R	A	VR	A	A	R	A	VR	O	O	R	R	A	A
2. Remittent fever	R	A	O	O	A	A	O	A	R	A	VR	A	VR	A	A	R	A	VR	O	O	R	R	O	R
3. Typho-malarial fever	R	A	R	A	A	VR	R	R	R	A	O	R	A	O	O	R	A	O	O	O	R	O	R	R
LOCAL DISEASES.																								
a. Intestinal Affections.																								
1. Diarrhoea	A	VR	VR	O	R	R	F	R	O	R	O	R	O	R	O	R	A	O	O	O	R	F	O	O
2. Cholera morbus	A	VR	VR	R	R	R	O	R	A	A	O	VR	O	VR	O	A	A	VR	A	A	R	O	O	A
3. Cholera infantum	A	VR	VR	R	R	R	O	A	A	A	O	R	R	R	F	VR	A	VR	O	O	R	F	O	A
4. Dysentery	VR	VR	VR	R	R	R	O	A	R	A	O	R	R	R	O	A	R	VR	O	O	R	O	O	A
b. Respiratory Affections.																								
1. Influenza	R	O	F	O	A	A	F	F	F	A	F	O	O	O	F	O	A	O	O	O	O	O	O	A
2. Catarrhal fever	R	O	A	O	A	A	F	F	F	R	O	O	O	O	F	F	A	O	O	O	R	VR	R	A
3. Laryngismus	O	O	R	R	R	R	O	O	O	A	O	O	O	O	VR	VR	A	O	O	O	R	A	O	R
4. Croup	A	O	R	R	R	R	F	F	F	O	A	O	R	VR	VR	VR	R	O	VR	VR	O	A	O	A
5. Whooping-cough	R	R	R	R	R	R	A	VR	VR	R	VR	VR	VR	VR	VR	R	A	R	VR	VR	VR	O	O	A
6. Congestion of the lungs	R	R	R	A	R	A	O	VR	VR	R	VR	VR	VR	VR	O	A	VR	R	VR	VR	VR	O	R	A
7. Pneumonia	R	R	O	R	R	A	O	VR	VR	R	VR	VR	VR	VR	O	A	VR	R	VR	VR	VR	O	O	A



While the table speaks for itself, it is possible to add to its practical usefulness by special comments and an occasional quotation from the remarks of some of the reporters.

It will be observed that rheumatism is reported as frequent in but three localities, and those are noted for their westerly exposure and damp sea breezes. Santa Maria and Los Angeles are the only points where the acute form is especially noted. Dr. R. W. Hill, San Buenaventura, reports "rheumatism common, due to exposure, irregular mode of life, and exhausted vitality."

In analyzing the various reports presented, it was found that quite a good many included by especial reference the muscular variety or myalgia. This distinction is important. For while acute rheumatism is of rare occurrence, myalgia is to be noted at almost every point below the fog line nearly every month in the year, but more frequently during the rainy season. Neuralgias of the head are less frequent than myalgia, while sciatica is still less frequent than the former.

Of the malarial affections, so essentially dependent upon local causes—intermittent and remittent fevers—are reported as frequent in but a single locality, the mining town of Calico; while in the majority of the twenty-seven places reported, they are entirely unknown, or very rare.

In regard to typho-malarial fever, there obtains the same difference of opinion here as to its entity, as in the East. Some reporters deny its existence, while others of equal experience from the same localities report its presence. With the almost total absence of strictly malarial fevers, it seems hardly reasonable that malarial complications should be found associated with typhoid symptoms. And yet, my personal observation confirms the reports from several points, that occasionally there is to be encountered a fever as distinctively typho-malarial as that seen in camp during the late war, and so designated by Surgeon J. J. Woodward, U. S. A.

It is proper to remark in this connection, that a difference of opinion has been noted as to the presence and prevalence of typhoid fever. The view held by a majority of the reporters is, that the disease is seldom or never seen in this region. It is reported frequent in but two localities, viz.: Compton and Calico; points remote from each other, and of widely different climatic peculiarities.

Dr. F. S. Whaley, the reporter from Compton, and for many years a resident of this State says: "Typhoid fever is the endemic fever of this section, and of the principal part of the State, according to my observation."

Dr. J. A. Crane of Santa Ana, writes: "A few well-marked cases of typhoid occur each year in our valley. A simple continued fever, bearing some general resemblance to typhoid, *but lacking the more essential features*, occurs rather more frequently. It is usually called typhoid for the lack of a better name. This form is rather more prevalent during the Autumn months."

Dr. C. M. Fenn of San Diego, says: "We have sporadic cases of *California* typhoid, *i. e.*, without the intestinal lesion."

It is noteworthy that San Diego and Santa Ana both report typho-malarial fever rare.

But two reporters trace their cases to specific origin. Dr. W. T. Lucas, of Santa Maria, says: "We have a sporadic case of typhoid now and then. We experienced a local epidemic in November and December, 1885, traceable to an old well of water that had been neglected until the owners could use it no longer. A new well was dug, but too late to prevent those using the water from being infected." Dr. O. H. Congar, of Pasadena, reports: "I have seen only four cases within the past eight years—



due to open ditch water being contaminated by hog wallowing, cattle excrement, etc."

It might be supposed that intestinal affections would prevail throughout this section by reason of the probable indiscreet use of fruit, but such is not the case. Diarrhoea is reported frequent at San Pedro, probably among the sailors, and at Calico among the miners. Dysentery is reported frequent at Calico, doubtless because of the insanitation incident to mining communities. The only other point where it is reported frequent is at Azusa, otherwise one of the most healthful sections of the State. In regard to this, Dr. Samuel McCurdy writes: "Dysentery is frequent during April, May, and June, or during the irrigating season. But we have very little sickness of any kind here. Like all Southern California, it is very healthy. The great danger to health is our open ditches when decayed vegetation is allowed to remain, and the water infected, though sparkling and bright, finds its way into our cisterns."

The only deleterious effects resulting from fruit are reported under the head of infantile convulsions. This form of trouble, so common east of the mountains, and intimately associated with dentition, is a rare affection here. Several reporters record cases of it, due to the ingestion of *unripe* oranges.

Respiratory affections, which in some form or other constitute the most powerful incentive to immigration to this section of the Pacific Coast, have demanded no little care in this report, and have been quite faithfully considered by the reporters. There has been a misunderstanding on the part of many as to the differential diagnosis between influenza and catarrhal fever. By the former is meant inflammation of the upper air passages, or common cold in the head: by the latter, superficial congestion of the lower air passages, stopping short of bronchitis, yet accompanied by cough, sometimes by a frothy mucus or slightly muco-purulent expectoration, and some elevation of temperature. Here, as elsewhere, these disturbances may exist separately or conjointly; and while occurring most frequently during the rainy season, they may prevail in a slightly epidemic form apparently independent of the weather. Reporters generally indicate the mildness of these cases, and the fact that they seldom demand medical treatment. It is noticeable that one or both of these affections constitute no inconsiderable part of the process of acclimatization, which nearly all newcomers must undergo.

It is also worthy of remark that persistent negligence of care and proper treatment during these attacks, when severe, frequently results in the establishment of nasal or naso-pharyngeal catarrh. This is more particularly true of persons residing on damp lands, or in localities exposed to the raw westerly sea breeze. Newcomers require to be constantly reminded that while this region has been designated semi-tropical, the marked diurnal range of temperature does not seem to entitle it to the name; but that by reason of the lowest degree registered daily by the mercury, this is a cool rather than a warm country. And, inasmuch as the cutaneous surface adjusts itself more readily to unusual elevations of temperature than to corresponding depressions, it is very essential that the residents of this region, as previously noted, wear woolen garments next to the skin all the year, and thus provide against the exigencies of the coldest period of the twenty-four hours. The weight of the woolen may be varied as between the wet and dry season, but it is really safer to make the change in the weight of the outer garments.

Croup and laryngismus are of infrequent occurrence.

Bronchitis is reported frequent only at the seaport of San Pedro.

Pneumonia, the scourge of the nation, east of the mountains, from the icy regions of the North to the semi-torrid regions of the extreme South, is almost a stranger here. Whether our soil and climate are uncongenial to the pneumo-coccus, or whether that enterprising microbe has his time wholly occupied as yet in the more densely populated sections eastward, remains for the present unknown. An occasional case of lobular pneumonitis is reported, but the lobar variety is rare.

Asthma, whether of the bronchial or cardiac variety, seldom originates in this section. Many cases come here for relief, and demonstrate the obstinate and as yet incomprehensible eccentricities of the affection. All of them do well; indeed, all of them recover, if willing to submit to the tyranny of the climate-hungry neurosis. Relief is not to be found in any one locality for all cases. Probably Nordhoff and Colton afford the environments demanded in the majority of instances.

Hay fever, the asthma of many aliases, has never been known to originate here. The nearest approach to it is in two cases of conjunctivitis from rose pollen, reported in persons who in the East were victims of rose-cold. As a rule, persons who have suffered an annual visitation from this miserable affection, at any point east of the mountains, enjoy complete immunity from invasion in Southern California.

The reports on pulmonary phthisis have been very full and candid. The mortuary records, whenever accessible, show a greater percentage of deaths from this cause than from any other. But it is also true that the vast majority of these deaths occur among persons who have come here already infected, in hope of restoration. Very few of them have resided here so long as one year.

Dr. C. B. Bates of Santa Barbara, writes: "This being a health resort, we have many cases of tubercular disease amongst our visitors. These diseases are rare, however, among the native white population, but common with the Spanish portion of the residents. This latter fact I ascribe:

"*First*—To close intermarriage through a long series of years.

"*Second*—To change of habits since the coming of the Americans (Anglo-Americans), they live more in their adobe houses, not so much out of doors as formerly, and poorer, perhaps not well nourished; and in many ways are not hygienically so favorably situated as in times past. Thirty or forty years ago, tubercular disease was rare among them; now, each year it becomes more common."

Dr. W. T. Lucas of Santa Maria writes: "We have more or less of phthisis all the time. But outside of the poorer class of *native* (Spanish) population, none to speak of except among those coming in from other localities." And in a foot-note he says: "Outside of a tendency to lung trouble I regard this a very healthy valley. Those who have a tendency to phthisis do not do well here."

Dr. J. Will Graham of Los Alamos reports: "Phthisis pulmonalis prevails here to a considerable extent, especially among the Californians" (Spanish). In a foot-note he writes: "You will notice that respiratory troubles are ahead of all other diseases; that is owing to the sudden and frequent changes of temperature in this valley."

Dr. R. E. Curran, San Buenaventura, reports: "Phthisis pulmonalis is common among natives (Spanish). Americans mostly imported."

Dr. R. W. Hill of the same place writes: "Phthisis is increasing among the native Californians, due to insufficient and improper diet and clothing, and poorly ventilated dwellings."

Dr. Ira Perry, late of Nordhoff, writes: "Only one case of phthisis known to originate in this valley (Ojai) in five years. A girl of eighteen

nursed her mother who died of the disease, and then continued to live in the same house until her own death from the same cause, a year or more subsequently. I think about one half of the deaths here during the last five years were from phthisis pulmonalis—come from abroad. This is a resort for consumptives, many of whom die, as they will anywhere when setting at defiance the laws of hygiene with reference to food, air, and exercise. As a rule the rich and lazy die; while nearly all who go to work improve."

Dr. W. L. Brown of Downey City writes: "I have seen many cases, but none that have originated here; nearly all, cases that have come here as a last hope."

Dr. J. S. Griffin of Los Angeles writes: "Phthisis pulmonalis, formerly very rare among native Californians (Spanish), is more frequent during the past few years. Imported cases are numerous."

Dr. J. P. Widney, Los Angeles, reports: "This disease among the Spanish has been rare, but it is growing more frequent as they mingle with Americans. Still in the native born population it is not so frequent as in the East and in Europe. Imported cases are very numerous."

Dr. J. H. Bullard of Anaheim writes: "Phthisis pulmonalis is occasionally usually introduced. Not rare among white-Spanish offspring."

Dr. J. A. Crane, Santa Ana: "Have seen three or four cases which it is said originated here, and pursuing a rapid course ended fatally in a few months."

Dr. C. W. Brown, Pomona: "Most frequent cause of death here, but in immigrants almost wholly. Some cases in Mexicans."

Dr. John C. Kerr, Pasadena: "This is more frequent than any other disease; but almost all cases come from the East. I have seen several cases of local origin, but they were among Spaniards, and were catarrhal in form."

Dr. C. M. Fenn, San Diego: "Like the poor always with us; but it comes chiefly from abroad. White Americans seldom if ever contract it here." In a foot-note he writes: "While phthisis not infrequently carries off the native Mexicans and Indian races, I cannot recall a single case of a white person contracting the disease here."

The remarkable uniformity of these independent reports in regard to the introduction and rapid extension of phthisis pulmonalis, among the Spanish natives, demands at least a passing notice; especially when taking into consideration the rarity of its origination among the Anglo-Americans.

With the general absence of the accepted climatic factors conducive to the development of phthisis, the physical conditions above enumerated by Dr. Bates more particularly, must be recognized as the remote cause of the race deterioration in this specific direction. It is not probable that the downward tendency having been once positively determined, any arrest may be expected.

The rapid increase of the white races has steadily placed the Spanish at sad disadvantage. Here as everywhere the rich become richer and the poor become poorer; and with the inevitable attendant evils of an impoverished condition, the near future will probably witness the extinction of these earlier occupants of this sunny southwestern shore, and phthisis will have not a little to do with the finale. But the pendulum, with an uniform propellant force behind it, must swing in an uniform arc. In-door residence, light houses whether of adobe (mud) or wood, abandonment of walking and horseback exercise, must eventually do for the rich American what similar conduct is effecting for the poor Spaniard.

The question of extension by contagion has not been broached by the

reporters, except in the inferential case at Nordhoff recorded by Dr. Perry. During the period covered by this report, three well authenticated cases have been brought to my knowledge by a careful, conservative, medical observer of Los Angeles. If the bacillus tuberculosis be accepted as the proximate cause, and the adoption of insanitary modes of life the remote, there remains no adequate barrier to the wide extension of phthisis here as elsewhere. The mildness of our climate attracts the feeble of all lands, and of these multitudes, cases of phthisis probably preponderate in the proportion of ten to one. As has been demonstrated, the joint occupancy of bed or room by the consumptive and the well, acts unfavorably upon the latter; and in many instances is followed by health failure and early death from phthisis.

Whether a "*propter*" from this "*post*" may be argued or not, satisfactorily to all, the oft observed fact remains. One of the most frequent occurrences throughout this region is this insanitary intimacy. Whether believers or not in the bacillus as a potential factor in the propagation of this, the greatest enemy of the human race, medical men everywhere owe it to the well, to protect them, so far as may be, from the almost inevitable evil resulting from such unfortunate association.

If the bacillus theory be true, the great danger to the general public lies in the myriads of these microbes which are daily deposited on every thoroughfare in the sputa of the suffering multitudes. Cultivators assert that the most virulent form of tubercular sputum is the dried and pulverized. Thus, the sunshine and the breeze, health giving and invigorating to the sick, may become the agents of destruction to the well. No needless alarm is proposed by these remarks, but in the interest of preventive medicine—the *medicine of the future*—the attention of sanitarians is urged with emphasis to this important subject.

The existence of the various cardiac affections is almost unknown except in the case of strangers.

Dr. Bates, Santa Barbara, writes: "Acute diseases of the heart are rare; chronic more common. Many strangers come here suffering from valvular disease."

Santa Maria and San Buenaventura may, to some degree, be considered as exceptions.

Dr. Lucas, representing the former, writes: "It seems to me, for a pastoral and farming community, we have considerable heart trouble here. Of course many cases come in from other places seeking relief."

Dr. Hill, of San Buenaventura, reports: "Rheumatic pericarditis is the most frequent form of heart trouble encountered with us. Valvular disease is quite common among our pioneers who underwent unusual fatigue and exposure."

Dr. Whaley, of Compton, writes: "Of organic diseases of the heart we have none; functional disturbances occur occasionally."

Dr. W. A. Brown, of Downey, says: "We often meet cases of valvular insufficiency newly arrived from the Western States; have met but two cases originating here."

In regard to hepatic affections, the general report is, "rare, except imported." Some few exceptions are noted.

Dr. Lucas, of Santa Maria, writes: "We have no diseases of the liver, except cirrhosis, due to the use of intoxicants."

Dr. Curran, of San Buenaventura, reports: "Hepatic congestion frequent; but no more so than is customary in warm climates."

Dr. Hill, of the same place, says: "Diseases of the liver are to be met with, due most frequently to the abuse of food and dram drinking."

Dr. Weldon, of San Pedro, writes: "Diseases of the liver plenty, from drinking." And in a foot-note adds: "There is a great deal of liquor drank here, and in consequence we have a great many rum stomachs and gin livers to patch up."

Dr. Griffin, of Los Angeles, remarks: "Diseases of the liver are rare, except from alcoholism or other excess."

Dr. C. W. Brown of Pomona, reports: "Diseases of the liver, I judge, are as common here as in the East. Much is brought from malarious localities."

Dr. Kerr, of Pasadena, writes: "Inactivity of the liver common here."

Dr. Crane, of Santa Ana, says: "Functional derangements of the liver not infrequent; organic, rare."

Dr. Fox, of San Bernardino, reports: "Some cases of cirrhosis. Functional disturbance not uncommon. Organic lesion, except from intemperance, rare."

Nephritis idiopathic, another terror of the United States, north and east of the mountains, is not established here as one of the prevailing diseases. We note the comments of those reporting it.

Dr. Bates, Santa Barbara, reports: "A few cases occur each year, usually caused by exposure to rain during the Winter, or to a long ride in a cold wind."

Dr. Lucas, Santa Maria, remarks: "We have a case now and then, generally due to exposure."

Dr. R. W. Hill, San Buenaventura, writes: "Acute nephritis often met with, caused by exposure, over-exertion, mental and physical. Intemperance a frequent cause."

Dr. J. C. Kerr, Pasadena: "A case now and then, caused by drinking."

The ordinary contagious affections are almost as infrequent as the non-contagious. But one especially noteworthy feature has been mentioned by reporters, viz., the general mildness of the attacks, and the absence of serious sequelæ.

Under the caption "miscellaneous," tænia alone is even occasional. From my own observation I am able to report its presence as by no means infrequent; but I am very sure it is far from being as common as the charlatans would have their patients believe. Indeed it has been reported that not a few specimens, said to have been removed from willing victims, proved to be celluloid.

From the foregoing it may be correctly inferred, that whatever may be the commercial importance of Southern California, or its future as the center of the great industries which are even now developing in our midst, its excellence as a health resort cannot be exaggerated.

"Within a circle of one hundred and fifty miles, one may find spots below the sea-level, or with an elevation ten thousand feet above it; spots that have nightly a heavy fog, and spots that never know the presence of a fog; places swept by an almost constant breeze, and others sheltered from all wind; the odors and gases from asphaltum and petroleum springs, or the air of the mountain pineries; the scent of the orange blossom, or the balsamic odor of the plants of the desert. Differences of elevation which elsewhere one travels a thousand miles to find, here are found in a radius of fifty miles."

No epidemic has ever visited this part of the State, and contagious diseases which have been brought here have never obtained a foothold. It is moreover a region of easy access by rail and steamer. Food of every variety is abundant, and all of the delicacies and comforts required by invalids are readily found.

## IRRIGATION.

By H. C. CROWDER, M.D., Member State Board of Health.

The question of the effect of irrigation in California is one that deeply interests every inhabitant of the Pacific Slope, and, in some localities, is the all-absorbing question of the day. Beautiful California, with her mild and invigorating climate, properly irrigated, would bloom like a rose.

The hot and arid plains of Colusa County, where one can travel half a day on a ranch belonging to one man, and where in 1884 were cast two thousand eight hundred and ninety-nine votes, could, with proper irrigation—which would cause a division of the land—support as many thousand voters as there are now hundreds, and then it is doubtful if the products could be taken care of without importing help.

It has been demonstrated beyond a doubt that oranges, lemons, and all the citrus fruits will grow and mature in Colusa County as well as in Los Angeles County. In the latter, land is worth from \$50 to \$500 per acre, while in the former it sells from \$20 to \$60. So much for irrigation.

The application of water used in irrigation varies greatly in manner, but may be described by two different methods, viz., first, by flooding the whole surface of the land by means of ditches, and the second, by sub-irrigation, where the water is conveyed through pipes beneath the surface of the ground. The latter method, being of recent date, will not be considered, owing to its being but very little used. In the application of water through open ditches, where the land is flooded, there has been various reports made by impartial judges, which are in some instances conflicting. In that portion of the country where the soil is sandy or gravelly loam of unknown depth, the water sinks, or if there is much slope, drains off very rapidly.

In Southern California, where irrigation has been carried on for more than a hundred years, there is but very little, if any, evidence that malarial diseases predominate; hence, we come to the conclusion, where irrigation is used scientifically, there will be an increase of malarial diseases *only as there is increased population in the country*. It is said that "all the M.D.'s in the State are in favor of irrigation; that it would increase their business one hundred per cent," etc. It would undoubtedly increase the population more than one hundred per cent, and in that way produce more business for all.

Along the bottom lands of rivers, where the drainage is not good, and where the soil is continually saturated or moist, the case is different. There can be found more or less intermittent and remittent fevers; and, in fact, all miasmatic and zymotic diseases prevail to a greater extent. Professor Loomis, of New York, includes those acute infectious diseases which depend upon poisons developed outside the body of the affected person:

These poisons possess two distinct characteristics: First, each poison is specific and distinct from every other in its action, and hence, inferentially in its nature, so that the pathological process which it incites is always identical in kind and associated with that one etiological element, and with no other. These processes thus become the means of differentiating this class of poisons. Second, all of these poisons possess the power of indefinite reproduction when placed under favorable circumstances, and their resulting

diseases are, therefore, generally endemic. When the poison affects large numbers at the same time rather than sporadic, such a poison is termed a virus, and has its origin either in the bodies of diseased living beings or in decomposing organic matter. Every virus is more or less diffusible, and may be conveyed by air, fluids, or solids; while in some diseases it becomes so localized that it can be transmitted by inoculation. These morbid agents give rise to distinctive diseases, either by changes which they produce in the blood or by their direct action upon the cellular elements of the different organs and tissues. When a virus originates and attains its full development only in a living animal, and is excreted in an active state, it is called a contagion, and the disease which it produces is contagious. When the morbid agent is solely the product of decomposing organic matter, it is termed a miasm, and the affection it develops is a miasmatic or malarial disease.

Contagions may be transmitted mediately or immediately, and are reproduced with each infection. Miasms are conveyed only by diffusion generally through air or water, and their activity is limited to a single infection.

A third form of virus originates solely in diseased animal organisms, but is excreted in a passive condition, and becomes active only in the presence of decomposing organic matter. The disease in whose development such a poison is the etiological factor, are termed miasmatic contagions. The theory of organisms, or the germ theory, maintains that the infectious poisons are living organisms which, being received into the blood, reproduce themselves indefinitely, and excite morbid processes which are characteristic of certain types of disease.

This theory at the present time is quite extensively adopted, as it so readily explains very many remarkable facts connected with the development and reproduction of this class of diseases. It is readily understood, and there are so many animal poisons which appear to act in this manner, that to one whose opinions are not based upon clinical experience and actual contact with disease, the arguments in its favor seem conclusive. According to this theory, all of the different forms of diseases included under the head of infectious may be reduced to two classes: first, infectious diseases which depend for their development upon a living animal organism; second, those which depend for their reproduction upon a living vegetable organism.

We all admit that these miasms and organisms are reproduced more rapidly under certain circumstances, but we have no proof showing that irrigation is the means of bringing about these favorable circumstances: on the contrary, it has been conclusively demonstrated that imperfect drainage more than irrigation tends to develop and produce these conditions. From my own experience and observation, I can only state that malarial and low types of fever have been more prevalent during the Summer months following a comparatively dry Winter than immediately after a very rainy season, and that too where there was considerable drainage.

## THE DRINKING HABIT IN CALIFORNIA.

By W. H. MAYS, M.D., Superintendent of Stockton State Insane Asylum.

Intemperance is assigned as the cause of insanity in about thirteen per cent of those sent to the asylums of this State. This falls far short of the truth. There is a disposition on the part of the relatives to hide the fact of drunkenness, and hence the exciting cause is set down to sunstroke, business reverses, trouble, blow on the head, etc. Lord Shaftesbury, an authority of the utmost weight, states as his opinion that more than fifty per cent of the cases of mental disease to be found in asylums are due to the drinking habit. My predecessor, Dr. G. A. Shurtleff states, as a result of his long experience, that intemperance produces more insanity on the Pacific Coast than any other influence. Nor, with what opportunities for observation I have had, do I hesitate to add my testimony that no factor is more potent and active in the causation of insanity.

If only the evil done by the inebriate could be limited to himself! Nothing exerts more deteriorating an influence on the race of man, sapping the mental and physical health of our people. Dr. Howe, of Boston, in his report on idiocy, makes the statement that of the three hundred idiots under his care, one hundred and forty-five had drunken parents. In one instance, he continues, where both parents were drunkards, seven idiotic children were born to them. "I receive patients daily at the Bicetre," says Dr. Moreau, "in whom I can trace back the origin of their malady to nothing else but the habitual intoxication of their parents." The following direct instances where the sins of the father were visited on the children occurred in the writer's experience during general medical practice:

1. The father, a respectable business man, met with reverses and "took to drink." Although the parent of two healthy children before this, the next child born to him was a puny, malformed creature, which died before reaching its fifth month.

2. A stout, bright girl, married a man addicted to periodical drinking bouts. Their child was born disfigured with a spina bifida, and died in a few weeks of meningitis.

3. A man, well to do, in a small country town, had for years indulged every few months in an occasional drinking spree of a week or so's duration. His son, when only thirteen years old, was seen reeling along the street in a bestial state of intoxication, and at eighteen was a bloated and besotted drunkard. Instances are not rare, in the experience of physicians, of this direct transmission of the drinking tendency from father to son.

If only the evil done by the inebriate were limited to himself! There are eight thousand inebriates in California to-day, at an impartial estimate. By inebriates, I mean persons who indulge in the excessive use of alcoholics, who cannot resist the craving. Of these, suppose one half are married and have families; for your drunkard is no disciple of Malthus; grant them only one child apiece; think what a terrible inheritance is being handed down, what a ghastly gift to our young State, four thousand children with an inborn tendency to vice and disease. Four thousand children who



start in the race of life with the millstone of their father's sins hung about their neck. Four thousand children with a bad organization, a proclivity to disease, a weak brain, an impotent will. Four thousand children who will only want some accidental exciting cause to push them over the border line of insanity.

If only the evil done by the inebriate were limited to himself! Looking at the family of an excessive drinker, even where intemperance has not yet brought social degradation and poverty, evidence of a heritage of weakness is generally to be seen. The girls are shallow, hysterical, with bad, explosive tempers, never under control, neurotic, emotional. The boys are dull, irresolute, infirm of will, creatures of passion and the baser instincts. They are often defective in bodily development and mental capacity. Prone to the feeling of their fathers, they are the recruits by which the grand army of the insane is constantly augmented.

A few words about beer. The consumption of this liquid is increasing daily. Fifty years ago very few Americans tasted beer, except as a rarity. It was regarded as a foreign drink. Even twenty years ago, the amount now drank would have been deemed fabulous. The idea has been entertained, and by those concerned in the brewing interest has been actively promulgated, that beer drinking is much less harmful than liquor drinking. It has ever been maintained that beer possesses nutrient properties. There is no truth in these assumptions. Nothing will lower the vital forces so steadily and surely, nothing will degenerate the organic tissues so rapidly, as the use of beer every day, and year after year. It coarsens a man, in appearance, in morals, in mental fiber, in physical constitution. It is more productive of brutality, sensualism, and the lower forms of crime than is whisky drinking. It is the beverage of the Bill Sykes, of the vulgar ruffian, the bestial tramp.

The habitual beer drinker is readily recognized by his appearance. His bloated face and form might at first sight suggest robust health, but, in reality, there is no one less able to resist disease. Sooner or later the kidneys and liver become diseased, fatty degeneration invades the substance of the heart, the vitiated system has no power of recuperation, and a slight cold or injury will carry him off.

But what of wine drinking? A halo of romance has from time immemorial glorified the juice of the grape. Poets in all ages and climes have sung its praises, have pictured to us the dancing bacchanals, the wine press spouting its stream beneath the bare feet of laughing girls, and so forth. How dearly old Horace loved a cup of old Falernian. Homer tells of wine in his day so strong that he had to dilute it with twenty measures of water. Diotimus, the Athenian, was nicknamed "The Funnel," from his wine-bibbing propensities. Cato and Seneca both loved wine not wisely but too well.

Wine producing is assuming such proportions in California as to warrant the expectation that it will soon exert some appreciable influence on the drinking habits of our people. Wine is the least harmful of all forms of intoxicants. The substitution of the lighter wines for beer or liquor would, I have no hesitation in saying, inure to the mental, social, and physical benefit of our population, and of the coming generation. In those regions of Europe where wine is produced and drank exclusively, the ratio of mental disease has always been smaller than where ardent liquors are consumed. M. Lunier has shown that those departments of France which do not cultivate the vine, contribute a much larger percentage of insanity than those which do. The rarity of intoxication among the Italian and French people on this coast is a fact generally acknowledged. But, assum-

ing that some form of intoxicant is necessary, which I earnestly deny, whether Californians will ever become a wine-drinking people is a question that time alone can answer. With many, the craving for strong drink, the demand for a fiery stimulant, the Berserker fury, is an inheritance from our North-Europe stock, and will not be sated by the soft anacreontic fluid. The majority of native born Americans pronounce wine an insipid sort of drink, and find it hard to get up a taste for it. Yet that the habits of a people may change in this respect is shown by the present magnitude of beer consumption, where fifty years ago it was comparatively unknown as an American drink.

One word, in conclusion, as to the daily use of stimulants. Alcohol taken constantly into the system interferes with nutrition. Its properties are such as to hinder the processes of food change, of disintegration, of assimilation, going on in the stomach and intestines. Upon nerve elements it has a highly detrimental effect. Carried to the brain it acts injuriously on the exquisitely delicate structures, damaging those finer brain cells which subserve moral feeling and will.

Does steady drinking then deteriorate a man mentally? For answer to this, look around among your acquaintances. Here is one of them, a well known business man. No one ever saw him intoxicated, but is he the keen, clear-eyed worker he was seven years ago? His tact is lost, his business sense dulled; in the fierce competition for trade he has allowed himself to be outstripped. Dr. Clouston says: "I have seen strong brains in our profession, at the bar, and in business, break down from chronic alcoholic excess, without their owners ever having been once drunk." And then, these steady drinkers, how quickly they drop off. Before they are fairly into middle age they succumb to some disease attended with degeneration. Four times out of five they leave behind them a progeny whose destiny it is to be a burden to the State, either in her hospitals, her almshouses, her asylums, or her jails. If only the evil done by the inebriate could be limited to himself!

## ALCOHOL, AND ITS INFLUENCE ON THE HUMAN FAMILY.

Inebriate Asylums—Their Absolute Necessity—They Should be Conducted by the State, under the Management of Persons having Special Knowledge.

By JAMES GREY JEWELL, M.D., Resident Physician, Home for Inebriates, San Francisco, California.

The subject of "Alcohol and its Influence on the Human Family," would, to properly present the matter, require, figuratively speaking, "tons of paper and oceans of ink," and much more time than a single life. In my estimation the subject is the most important, next to everlasting salvation. Hence a paper of this kind will admit of only a mere skimming over the surface of this vast sea.

To begin, then, let us inquire very briefly, "what *is* the liquid commonly known as alcohol?" In reply to this question, we will find it to be a chemical compound, generated for the most part in vegetable juices and infusions, by fermentation or distillation. Some yield much more than others. The ripe, red berries of the mountain ash yield three quarts of alcohol to the bushel. It is also obtained from honey, wood, rancid butter, old cheese, and from a thousand and one other substances.

### THE ALCOHOL FAMILY.

There is a series or family of alcohols, very similar in character, only varying in quality and effect, but all agreeing in one particular: *they are all poisons*. Let us glance at a few of them:

We have *methylic alcohol*, distilled from wood.

We have *ethylic alcohol*, distilled from fermented liquids, commonly called wine spirit.

We have *butylic alcohol*, distilled from fermented beet root.

We have *mylic alcohol*, commonly known as *fusel oil*, distilled from potatoes and grain, especially when they are decayed.

There are many other varieties of alcohol, too numerous to mention here; suffice it to say they are all closely related to the father of evils, the vile spirit of the cup. In this connection an astounding fact may be stated, *i. e.*, in the United States we spend three times as much in one year for alcohol and tobacco as we do for bread, the exact figures being \$1,500,000,000 for alcohol and tobacco, and only \$505,000,000 for bread.

### ADULTERATION OF LIQUORS.

It is not alone the ill effects of the alcohol which the drinker suffers from, but the willful drugging and poisoning of nearly all alcoholic liquors by those who deal in and manufacture them. I distinctly state that I do not mean *all* who are engaged in the traffic, for I am well aware that there are as honorable men in this business as any other. But there are also many villains, who will stop at nothing by which they may gain a dollar. There are many ways of drugging or "doctoring" liquors. One of the most rep-

rehensible is by the use of strychnine, which gives to all alcoholic liquors a peculiar mellow flavor ("age," as it is called), much admired by chronic drinkers. Strychnine, as every intelligent person knows, is one of the most deadly poisons; it is insoluble in water, but is entirely soluble in alcohol; it exerts its force on the nerve centers; a grain and a half is generally enough to produce death. Liquors drugged by strychnine cause trembling, rigidity of the muscles, and give a maniacal expression to the face. In the last stages the patient has convulsions, labored breathing, he is almost pulseless, the lips, tongue, and fingers become blue, the face is livid, the eye is dilated, he foams at the mouth, and dies like a dog with hydrophobia.

Thus has many an erring mortal, unconscious of his danger, been sent suddenly to the grave, while others linger, in great pain and decrepitude, totally ignorant of the cause of their torment. It is quite beyond human conception that it should be necessary to persuade men *not* to drink such infamous compounds, when science clearly reveals their nature and effects upon human health and human life.

The salts of copper and lead, fusel oil, and arsenious acid are often used for adulterating liquors. All of these are powerful poisons, but strychnine and fusel oil are most frequently used. Fusel oil intoxicates more rapidly and powerfully than ordinarily pure alcohol of equal strength, but its after effects are of the most disastrous character. As before noted, it is generally obtained from *damaged* grain or potatoes, which are selected *purposely* by the distiller. It produces a deep drunkenness and frenzy, and terribly disorders the functions of the brain. Time will not permit me to go into detail in these matters; suffice it that *alcohol, whether drugged or pure, is the great consumer of man, his most determined and deadly enemy*. By observing the chemical formulæ of all alcohols, we are astonished at the close relationship which exists between them; no matter from what source derived—from wood, old cheese, vegetables, fruits, or rancid butter—they are all made up of the same elements, viz., carbon, hydrogen, and oxygen, only differing in the proportions of those elements.

Alcohol has several physical, chemical, and vital properties, which it is well to understand:

It is *combustible*: pour some in a dish, light it, and it will burn, even without a wick.

It is a *desiccant*, a drier, which is caused by its great affinity for water: so great is this affinity, that, as Professor Flint says, it absorbs about three times its bulk of water; hence it is extremely difficult to obtain alcohol in a perfectly pure state, as it readily absorbs water from the atmosphere. As medical men, we preserve many of our specimens in alcohol, and we know that the softest—the brain specimens—soon become shriveled and hard by the affinity of alcohol for the watery elements. Strong alcohol will, to some extent, cook flesh or meat, by its action on the albuminoid elements of the flesh. A very simple experiment will prove this: Break an egg, detach the white or albuminous portion from the yolk; pour strong alcohol upon this albuminous portion, and you will observe that it will become opaque and hard, just as if it had been dropped in boiling water. This is due to the desiccating or drying property of the alcohol, and it is through this property that alcohol does its work of destruction on the brain, the liver, the stomach, the lungs, the kidneys, the blood corpuscles, and various other parts of the body. An anomaly presents itself here, for it is said that an eminent anatomist (Hyrti) could distinguish the brain of a drunkard, in the dissecting room, in the dark, by its *hardness*; and yet it

is an equally well known fact, among medical men, that alcohol does produce a species of meningitis, or *softening* of the membranes of the brain.

Alcohol is *antiseptic*: it possesses the property of preventing fermentation or decay, and yet it is itself the result of fermentation and decay.

Alcohol is, to some extent, *anæsthetic*: this peculiarity can be observed in cases of chronic alcoholism, where the senses are perverted or lost. If taken in sufficient quantity, surgical operations may be performed almost without pain while the patient is under its influence. The two great anæsthetics, chloroform and ether, are both derived from alcohol.

Alcohol is extremely *volatile*: this fact enables us to detect the drinker by the odor from his breath.

Alcohol is an *irritant*: place a drop of even diluted alcohol in the eye, or upon a raw surface, and it will soon produce a most intense inflammation.

Alcohol is *narcotic*: after imbibition it first acts as an *excitant*, but in a short time it benumbs the sensibilities, and thus relieves the senses of fatigue temporarily. Persons who die from alcohol poisoning present all the appearance of narcotic poisoning.

Alcohol is a *stimulant*: a very powerful, but temporary, diffusible stimulant. Some authors argue truly, from experiments, that it does not increase, but lessens the strength.

#### GENERAL EFFECTS UPON MANKIND.

In fine, alcohol is the intoxicating ingredient in all spiritous liquors. Diluted, as in the ordinary whiskies, brandies, wines, etc., it temporarily stimulates and excites the system, renders the pulse full, gives an apparent energy to the muscles, and exalts the mental faculties. But as an article of daily use, as a beverage, as we shall see, no matter in what form it is taken, it is *always* detrimental, and produces the most deplorable results. It poisons the child in the mother's womb, when used by the mother during pregnancy, for a *drunken mother* will bring forth a drunken child, or what will almost certainly become a drunkard. It poisons the creature before it is begotten, because a *drunken father* will beget a child that will become a drunkard. Hence, *as a rule*, the children of drunkards become drunkards as certainly as two and two make four. Eminent opinions on this heredity will be shown further on. Of course, like all rules, there are exceptions to this rule; isolated cases, where, by strict guardianship or high moral training, the abyss is avoided. I think I may say, with a great degree of certainty, if we can find that a child was begotten during a debauch of either parent, that child will almost certainly become a drunkard.

#### ALCOHOL AS A POISON.

According to Stillé and other eminent authorities, alcohol is poisonous to all animals. Leeches wet with it die in two or three minutes; when partially immersed in it, that part of the body which the alcohol touches becomes paralyzed. If forty drops be injected under the skin of a frog, death takes place in one minute. Half an ounce, something over a table-spoonful, of strong alcohol was injected into the jugular vein of a dog, and it produced instant death by coagulating the blood. Dogs fed upon alcohol become very quarrelsome with other dogs, gradually refuse food, and die.

## EFFECT ON THE STOMACH.

We frequently read in the daily press accounts of a sudden death, after drinking a quantity of liquor—say a pint of whisky. Dr. Taylor relates the case of a man who died in half an hour, after drinking a bottle of gin—something over a pint. Dr. Seaverns speaks of a child which died in twenty-four hours, after swallowing one ounce of rum. A few ounces of strong alcohol—say six ounces—taken into the stomach, and absorbed into the system, will kill a very strong man, in a very short time. Where these facts are known people wonder why Smith, Brown, and Jones don't die, as they are very hard drinkers. It is because that alcoholic liquors, used as a beverage, are composed of alcohol very much diluted with water. Ordinarily good whisky or brandy, if there can be anything good in that which is bad, contains about forty per cent to fifty per cent of alcohol, *i. e.*, they are about half water. But notwithstanding they are so much diluted, so powerful is the poison of alcohol that when taken into the stomach, even in this diluted state, congestion of the coats and vessels of that organ almost immediately ensues. How do we know that this action occurs? I answer, from experiments made in many cases, by eminent authorities, but especially by Dr. Beaumont, of the United States Army, in 1822, through an opening in the stomach, made by a gunshot wound, in the left side of a Canadian lad, named Alexander St. Martin, tearing away the integuments and muscles, perforating the stomach, leaving an aperture two and one half inches in circumference, through which the whole process of digestion, and the action of liquids and solids, could be studied. Thus it was proven by experiments, that when alcohol, in any form, was taken into the stomach, it produced congestion, *by acting as an irritant*. If there be food in the stomach when alcohol is taken, as was proven also by Dr. Monroe, of London, digestion is immediately stopped, until the alcohol is absorbed. The alcohol, being antiseptic, stops fermentation, hence stops digestion. And thus it is that an habitual user of alcoholic beverages *must* become a dyspeptic. The walls of the stomach become hardened, thickened; the peptic glands, which secrete the gastric juice, become atrophied, are rendered inactive, and the supply of the gastric juice, which is so essential to digestion, is materially diminished. It does more—it precipitates the pepsin from the gastric juice, and renders that fluid useless. In nearly all cases of *chronic* alcoholism we will find *inflammation of the stomach*, resulting in foul ulcers, and cancerous diseases of that organ. The functions of the stomach, in cases of this kind, are entirely suspended. The power to digest food, and every process of waste and repair, is weakened. The patient does not willingly take food; may not have taken any for days and weeks. If food is forced upon him the stomach rejects it. Nausea and vomiting are present. He cannot even retain water, except in very small quantities. Sometimes a large quantity of clotted blood is ejected. If the patient dies with *delirium tremens* a post-mortem examination will generally reveal the stomach black with mortification.

## EFFECT ON THE NERVES.

The daily use of alcoholic drinks, *even in small quantities*, commonly known as "tippling," affects the nervous system detrimentally in many ways; the nerve cells and nerve fibers and muscular fibers are atrophied or wasted away; the principal organs become saturated, and we have fatty degeneration of the nerve and muscular cells and fibers, and other tissues of the body, resulting in paralysis.

The "rum blossom," or large, red, pimpled nose, is a well known evidence of chronic alcoholism; this condition is caused by paralysis of the nerves that keep the blood vessels of the nose in proper condition, thereby regulating the supply of blood to that part. When the nerves are paralyzed the blood vessels relax, become filled with blood, become engorged, congested; the nose grows too rapidly, and sometimes acquires an enormous development.

#### EFFECT ON THE BRAIN.

The brain in health is one of the most delicate organs of the human system; it is so soft that the bony skull is required to keep it in shape; the sharpest knife can scarcely cut it without tearing. This softness and fragility is necessary that it may the more readily receive and transmit impressions. The use of alcohol as a beverage changes all this. It has a special affinity for the brain, which absorbs more than any other organ, while it hardens the membranes which develop the nervous matter. Some high authorities take the ground that a once thoroughly intoxicated brain never fully recovers its original power. In health, as a rule, the brain is of a delicate pink color; by alcoholic stimulation it becomes a most intense red, which is produced in the same way as in the nose—by paralysis of the nerves controlling the blood vessels. When a drunkard's nose or face is red his brain is red; it is engorged and congested; and so are his lungs, his stomach, his liver, his kidneys, and other organs of his body. His physical being is blushing for the manner in which he is outraging nature. When we reflect that the brain receives one fifth of all the blood in the body, we can readily understand that it participates more largely in the injury done by alcohol than any other organ in the body, with the possible exception of the liver. When the brain of a chronic inebriate becomes hardened, it is pickled in alcohol precisely as a student pickles the brain of a dead subject, to harden it before it can be dissected. When the brain is thus saturated with alcohol, the patient is liable to have one of many diseases, including epilepsy, apoplexy, paralysis, vertigo, meningitis, or softening, delirium tremens, heart disease, dropsy, diseases of the stomach, bowels, liver, kidneys (which become fatty or waxy), and finally to wind up with insanity or death.

#### EFFECT ON THE LIVER.

Alcohol when taken into the stomach is rapidly *absorbed*; it is not digested, but is absorbed, and much of it is carried to the liver by the portal veins; it changes the color of the bile from yellow to green, and sometimes even to black. In chronic cases, the liver is frequently increased to double and even treble its natural size, even to weigh from twenty to thirty pounds. Next to the brain, the liver takes up the largest quantity of alcohol. Occasionally, by some peculiar idiosyncrasy, in the chronic drinker the liver shrinks and assumes a peculiar appearance, known as hob-nail liver. By alcoholic abuse, it becomes the seat of many characteristic alterations—it is enlarged, it is fatty, it is nodulated, it is contracted, it is hardened (or cirrhotic), or presents the appearance of yellow wax. In many cases the portal veins become obliterated by inflammation, and this results frequently in abdominal dropsy.

## EFFECT ON THE HEART.

The heart, when in a healthy condition, as is generally known, is about the size of an ordinary fist, and weighs about eight or nine ounces. It is a hollow muscle, which, by contraction, propels the blood to the remotest parts of the extremities. The amount of work performed by this little organ is enormous; it beats about one hundred thousand times per day, and exhibits a strength at each pulsation equal to ten pounds. Now, as a healthy man's heart beats about seventy-two times a minute, four thousand three hundred and twenty times per hour, or one hundred and three thousand six hundred and eighty times per day of twenty-four hours, its lifting power is equivalent to the enormous sum of one million thirty-six thousand eight hundred pounds, or more than five hundred tons per day, one foot high! Several causes, such as rapid walking, running, lifting, mental labor, excitement of any kind, may increase the heart's action, and thereby bring an extra strain upon it, and produce more or less temporary or permanent injury. It can, therefore, be readily understood, that it is of the utmost importance to preserve the heart's integrity, and thus insure the safety of the rest of the body. If we turn from the healthy man and examine the heart of a chronic inebriate, we will find that his heart (like his nerves and muscles) is subject to fatty degeneration; it becomes loaded with fat, upon its exterior and in its walls. This increased weight, of course, greatly weakens its action, as may be readily discovered in the habitual drinker, whose pulse is weak, feeble, intermittent, and whose extremities are generally cold, because the heart is unable to do the work required. All physicians know that alcoholism is a common cause of heart disease. The muscular tissue is turned into fat, and such a person, if much excited or frightened, or caused to run a distance, will suddenly die and be precipitated into a drunkard's grave, because the heart is enfeebled and cannot lift its five hundred tons per day. It is stated on high authority (Steele's Hygienic Physiology), that two ounces of alcohol (which is equal to about two ordinary drinks of whisky or brandy), increases the heart's action six thousand beats in twenty-four hours; which is an increase of work for the heart equal to the lifting of a weight of seven tons one foot high! After the feeling of stimulation at the outset of a debauch has passed away, the drinker feels a terrible reaction, a physical languor, a letting down; the heart flags, the brain and muscles are exhausted, and rest and sleep are imperatively demanded. The machinery is nearly run down—the patient must have sleep or he dies. After a long continued use of alcohol, or where a large quantity has been used in a short time, we find fatty degeneration of the muscular fibers of the heart, so that it loses its power to drive the blood to the extremities, and very soon “fails to respond to the spur that has urged it on to ruin.” This fatty degeneration from alcohol is also to be found in the muscles, liver, nerves, and kidneys, in the form of fat cells, *unhealthy fat cells*, which show an insufficiency of oxygen in the blood. When you see a flushed face or a bloodshot eye in a person whom you know indulges in alcoholic liquors, even in a moderate way, you may put it down as a fact that these superficial appearances indicate *positively* the condition of the internal organs. The delicate linings of the brain, heart, stomach, liver, and lungs, are congested and are the color of the blushing cheek. When the alcoholic habit has become chronic, the color becomes permanent, and the discolored, blotched skin reveals the condition of the internal organs. Owing to the affinity of alcohol for water, all the membranes become somewhat dry, thick, and hard; they shrink upon the sen-



sitive nerves, causing pain; their thickness and hardness stiffen the joints and make the muscles weak and flabby, and in this way every organ in the body feels the change.

#### EFFECT ON THE BLOOD.

The affinity of alcohol for water causes a burning thirst to all drinkers, hence they generally use large quantities of liquids, mostly beer; this has a tendency to dilute the blood, which flows more freely from a wound in the drunkard; his blood does not coagulate like healthy blood, and this renders an accident or surgical operation very dangerous to such persons. Sometimes this condition of the blood is reversed in drunkards who use only *strong* liquors, which tend to coagulate the blood in the smaller vessels; in that case there is great liability to an obstruction to the flow of the vital current through the heart, and it may form clot in the heart, producing instant death, or it may cause brain disease, and lay the foundation of paralysis or apoplexy. The blood corpuscles in a healthy, temperate man, are wonderfully symmetrical, being flattened, concave discs, and give color to the blood. They adhere together in groups, and resemble piles of coin. But the use of alcohol destroys all their symmetry, and causes them to become shriveled, irregular, and mottled, and their power to hold and carry oxygen, which is their peculiar province, is very much lessened. Dr. Carpenter, the distinguished physiologist of England, recently deceased, says, "the effect of alcohol on the blood is observed when diluted to the extent of one part in five hundred."

#### EFFECT ON THE LUNGS.

The effect of alcohol upon the lungs is very apparent; it prevents the oxidation of the blood, by interfering with the red corpuscles, in their task of carrying oxygen. Anything that checks this oxidation (to coin a phrase) of the blood, or hinders the deposition of new matter, diminishes the vital force. As was remarked above, even so small a quantity as one drop of alcohol to five hundred drops of the blood, will materially check the absorption of oxygen in the lungs. The cells being unable to take up oxygen, retain their carbonic acid, and the blood returns to the body from the lungs uncleansed, carrying back into the system, according to Dr. Hinton, as much as thirty to fifty per cent of the refuse matter, which the body has tried to throw off; and thus the patient is slowly poisoned, as the lungs no longer furnish properly oxygenized blood. It is well known that a person deprived of oxygen—the life-giving oxygen—cannot live; and so, the chronic inebriate, being deprived of the quantity of oxygen necessary for a healthy person, is dead to that extent. He is weak, becomes emaciated, and is peculiarly liable to disease, especially epidemic diseases. I have had a great deal of experience with drunkards, and I give it as my opinion, that the drunkard is at all times, and under all circumstances, more predisposed to death than the temperate man. This is a well known fact among medical men, but it will serve my purpose to quote one distinguished authority, Dr. Huber, who saw, in one town in Russia, two thousand one hundred and sixty persons die of cholera, in twenty days. He says: "It is a most remarkable circumstance, that persons given to drink, have been swept away like flies. In Tiflis, with twenty thousand inhabitants, every drunkard has fallen, *all are dead*, not one remains!"

There is also a peculiar form of consumption of the lungs, known as alcoholic phthisis, caused entirely by the long continued and excessive use

of alcohol. It generally appears late in life, attacking those who have had splendid constitutions, but it soon reduces them to mere ghastly shadows of their former selves, and terminates in death, as it is incurable.

#### EFFECT ON THE KIDNEYS.

As with the heart and liver, so with the kidneys; they undergo fatty degeneration, from the effects of alcohol; the cells become filled with fat, and are unable to separate the waste material which comes to them to be thrown off, and it is, consequently, returned to the circulation. The membranes of the kidneys become so diseased as to allow the albuminous part of the blood to filter through, and thus the body is robbed of one of its most valuable constituents. The experience of medical men has made it an indisputable fact, that *three fourths* of all the cases of *Bright's disease of the kidneys*, occur in drunkards, or drinkers of alcoholic liquors.

#### ALCOHOL IS NOT A FOOD.

So far as known alcohol contains no nutrient property. And yet I have known well authenticated cases where men have *apparently* existed on alcohol, partaking of no food whatever, for six weeks at a time. They were really consuming their own bodies. Professor Flint says: "That alcohol is incapable of forming any part of the body, is admitted by all physiologists. It cannot be converted into brain, nerve, muscle, or blood." Professor Steele says: "If you take bread or beef into the healthy stomach, nature welcomes its presence; the juices of the system dissolve it, and transform it for the use of the body. A million tiny fingers called lacteals and veins, grasp it, work it over, and carry it into the circulation. The blood carries this bread and beef, or other healthy food, in its new form, throughout the system, wherever it is needed, to repair or to build up the house you live in. It is no longer bread or beef, it has become muscle, or bone, or blood, it has given you new life and strength. How different when alcohol is taken. It receives no welcome, nature treats it as a poison, as a brave gentleman treats an enemy who intrudes upon his household; nature seeks to rid herself of the intruder as soon as possible. Every effort is made by pouring the juices into the stomach, to dilute the alcohol, and thereby weaken its power. All the servants of the body, the stomach, the lungs, the kidneys, the perspiration glands, combine and set to work, to throw the enemy out of the body. So far as known, the alcohol thus rejected, is entirely unchanged. Nature has no use for it.

#### ALCOHOL AND BEER.

Many persons regard beer as nutritious, because it contains little alcohol, and because it makes fat. But what sort of fat does it make? Look at a piece of suet, that is the kind of fat beer makes! It does not make muscle, or bone, or nerve, or sinew. It does not give strength. But it does make you feel dull, and makes the circulation sluggish; and thus the waste matter of the system is not promptly carried off. The muscles are loaded with this fat, the skin is puffed out, and the beer drinker *looks* plump, and thinks the beer is doing him good. But he is most woefully deceived. It is not the plumpness of youth, which comes of good blood and healthy juices. Beer drinkers suffer generally from enlargement of the liver, which often grows to enormous size. Some nursing mothers use beer because it

makes them feel temporarily better; the small quantity of alcohol in the beer has lied to the mother, and the little innocent child which nurses the drugged milk from the mother's breasts, is so good and quiet, because it is boozy from the alcohol in its mother's milk. Many a future drunkard is made in this way.

It does not seem to have occurred to many parents, that the swill milk which does the little innocents so much harm, and carries them off so rapidly, is the product of breweries and distilleries.

And so in "high" life (which in the succeeding generation becomes very "low life"), a man and his wife attend many dinner parties, or other festive gatherings, where wines and liquors are freely partaken of. The husband drinks, the wife drinks; he is affected considerably; she is affected some; both are under the influence of alcohol; the system is heated to a passionate glow; a pregnancy follows; the result is a future drunkard. And it is thus that our "so called" *best families* are bringing forth a race of drunkards, idiots, or insane, for the future, and this will continue until every kind of alcoholic stimulant is prohibited from general use as a beverage.

#### HEAT.

Chronic inebriates have a thousand and one excuses for drinking alcoholic liquors; one of the most common in cold climates, or in Winter time, is, that it imparts heat throughout the system. If this be so, it is of the most temporary character. There is, probably, a little flush on the surface, caused by the warm blood that is being sent throughout the body, in consequence of the enlargement of the capillaries, and the increased action of the heart. *But, according to the best authorities, no increased heat is really developed.* On the contrary, the forcing of the blood rapidly to the surface causes it to cool faster, and a reaction soon follows; the drinker becomes chilly, and by experiments with a delicate thermometer, under the tongue, it will show a fall in temperature, sometimes of two degrees below the standard temperature of the body. Several hours are sometimes required to restore the normal temperature.

Dr. Hayes, the distinguished Arctic explorer, says: "While fat is absolutely essential to life in arctic countries, *alcohol is positively injurious.* I have known strong, able-bodied men to become utterly incapable of resisting cold, in consequence of the long continued use of alcoholic drinks." Dr. N. S. Davis, of Chicago, in his experiments to determine the effects of different articles of food upon the temperature of the body, says: "During the digestion of all kinds of food the temperature of the body is increased, but when alcohol is taken, the temperature begins to fall, within half an hour, and continues to decrease for two or three hours, and is in exact proportion to the quantity of alcohol taken."

#### STRENGTH.

The use of alcohol deprives a man of his strength, and unfits him for severe bodily exertion. All those athletes who are in training for running, rowing, wrestling, boxing, or other contests where strength is required, are prohibited the use of alcoholic liquors. Dr. Richardson, before alluded to, proved this loss of strength, by experiment, most conclusively. He placed a graduated weight on the hind leg of a frog, and, by means of electricity, he stimulated the muscles of the frog to their utmost power of contraction, and thus found just how much the frog could lift in its sober condition.

He then administered alcohol, and, although he applied the electric current freely, the response of the muscles became more and more feeble as the alcohol took effect, until at last the frog could raise less than half the amount it lifted when sober.

In the human being we see this loss of muscular strength, by the use of alcohol, in various forms. As the drinker becomes drunk his lower lip falls first, then the muscles of the lower limbs weaken and he staggers, his steps are uncertain and he falls, utterly devoid of strength, a helpless mass of humanity.

#### HEREDITY.

I am often asked, "Do children inherit the desire for alcoholic stimulation from their parents?" Invariably my reply is, "Yes." *There is no possible doubt of it*, and I say this advisedly and thoughtfully, after having treated and conversed with thousands of cases of alcoholism, in both sexes, of all nations and colors, old, young, and middle aged. We inherit from our parents our features, our physical vigor, our mental faculties, and something of character. Sometimes a generation is skipped, but the qualities will reappear in the next—the virtues as well as the vices—but most certainly the vices. Dr. Oliver Wendell Holmes says: "We are omnibuses in which all our ancestors ride." Dr. Willard Parker, the late eminent New York physician, says: "There is a marked tendency in nature to transmit all diseased conditions. Thus, the children of consumptive parents are apt to be consumptives. But of all agents, alcohol is the most potent in establishing a heredity that exhibits itself in the destruction of mind and body." Its malign influence was observed by the ancients long before the production of whisky or brandy, or other *distilled* liquors, and when *fermented* liquors or wines only were known. Aristotle says: "Drunken women have children like unto themselves." Plutarch says: "One drunkard is the father of another." The drunkard by inheritance is a more helpless slave than his progenitor, and his children are more helpless still, *unless on the mother's side there is untainted blood*. For there is not only a propensity transmitted, but an actual disease of the nervous system. Dr. Howe, of Boston, a most distinguished authority on this subject, says, that of three hundred idiots in Massachusetts, at the time he was writing, *one hundred and forty-five were the children of drunken parents*. Dr. Madden, physician to the "Hospital for Sick Children," Dublin, saw many cases of inherited inebriety; also, one case of delirium tremens in a boy of eight years of age, son of a drunken mother. Dr. Barlow, of London, physician to the "Children's Hospital," in Great Ormond Street, says he has seen several well marked cases of hob-nail liver and dropsy in children from the use of alcohol; all children of drunken parents.

#### INSANITY IS PRODUCED BY ALCOHOL.

There can be no longer any doubt in the minds of intelligent medical men and laymen, who have made somewhat of a study of alcoholism, that it is productive of insanity in a remarkable degree, both directly and indirectly, by softening of the brain, family troubles, etc. Alcoholism is given as the cause in twenty-one per cent of insane cases received at the Royal Asylum, at Morningside, London. In Nottingham Hospital for the Insane, twenty-five per cent is accorded to alcoholism. Alcohol is said by some authorities to cause insanity by its toxic action on the brain, changing its organic composition, and deteriorating its functions—thus we have insanity caused directly by alcohol.

## DRUNKENNESS IS A DISEASE.

Alcoholism, if not a disease in itself, certainly produces many diseases, and where inherited undoubtedly becomes a disease *per se*. Dr. Boddington, an eminent English authority, declares that all habitual drunkenness *is a disease*, and this coincides with my own experience. The "American Association for the Cure of Inebriates," composed of Superintendents of inebriate asylums, has announced that "*intemperance is a disease.*" How astonishing it is, then, that our Federal Government, our State Legislatures, and our municipal bodies, pass laws, granting permission for the sale of alcoholic beverages, well knowing that such beverages disease the very flower of our country, male and female, and drag tens of thousands to the insane asylums and the grave every year. They certainly would not pass laws to disseminate yellow fever or cholera, and yet alcohol carries off many more than either. When a man or a woman becomes a confirmed, habitual drunkard; when he or she develops an irresistible, uncontrollable morbid impulse to drink alcoholic stimulants, *they are suffering from a disease* known to medical men as *dipsomania*—alcoholism. In fact, they are insane on the subject of drink. And when a man or woman cannot control their appetite for drink, they should be considered of unsound mind, and be taken care of by the authorities, and kept from doing harm to themselves or others, the same as other dangerous persons. There is no telling when such a person may become violent. They are always *dangerous*, no matter how mild they may appear to be.

## HOW ARE WE TO COMBAT AND OVERCOME THIS GREAT EVIL?

The State should take action *at once*, by enacting laws to *prohibit* the sale of alcoholic liquors as a beverage. Some will argue that this cannot be done generally, because it interferes with trade. It is not my province in this paper to argue that no interest should be permitted to exist which aims, directly or indirectly, at the life or happiness of the citizen. If prohibition is a step too far in advance, then the State and municipal authorities should enact stringent laws, with heavy penalties attached, curtailing the sale of liquors by heavy license, and by greatly decreasing the number of drinking places.

The State should establish asylums for drunkards, under the management of those having great experience, and the Courts, and Commissioners of Lunacy, should be authorized to commit chronic drunkards to these asylums, for not less than one year, and in some cases for life. The first commitment should be for one year, during which time the patient should undergo a course of treatment for this malady. At the end of his term he should be released, but if he resumed his former habits of intoxication he should be again committed, for two years. If committed a third time it should be for three years, and if a fourth time, *it should be for life*; because a patient who will not reform in six years will not reform at all. The patients in these asylums should be made to reimburse the State for their expenses, either by paying for their keep, or by laboring at some trade or employment, so as not to be an incumbrance on the State. The money for the support of these institutions should come from those benefiting by the sale of alcoholic liquors; and there should be provision made in the law so that a certain amount, say one fourth, of the patient's earnings should go to the State, one fourth to be retained for him, and paid to him on discharge, and one half to his family, if he has any; if no family, then one

half to the State and one half to the patient on discharge. The State, the patient, and his family would benefit greatly by such a course. Crime would decrease, the death rate would decrease, and human happiness would be greatly increased. Time, restraint, moral influences, the exercise of strong will power, and constant employment, are the means, with proper medicines and discipline, by which drunkenness is to be cured. Of course, *prohibition* would be the best of all means to prevent excessive drinking, and, at the same time, to decrease poverty, crime, disease, insanity, and death; but so long as Federal, State, and municipal governments license the sale of alcoholic liquors, which license gives the right to make drunkards, so long will we have drunkenness and all of its horrible attending evils. The State protects its citizens from the thief, from the gambler, from the courtesan; it protects them from other poisons by enacting laws to prevent their miscellaneous sale; why not protect them from alcoholic poison, which, in this country, consumes hundreds of millions of dollars annually, and kills tens of thousands of the fairest in the land?

# THE PROPHYLAXIS OF TRICHINOSIS.

By ALBERT ABRAMS, M.D., San Francisco.

It would be highly injudicious were we to attempt, in this article, to encompass the entire literature in reference to *trichinosis*, for such an endeavor would only prove to be a mere repetition of all that is already contained in our modern text-books; but the preventive measures adopted, especially in Germany, for abating the propagation of this dire disease should merit our earnest consideration; and for the purpose of detailing these means, which have not received due publicity, this article was written. The prophylaxis of this disease signifies in reality our treatment, for when the disease has once manifested itself in all its virulence, our treatment is purely symptomatic. True, when we are so fortunate as to encounter the affection in its incipency, prior to the time when the trichinæ are divested of their capsules by the gastric juice, it is then possible to check the progressive tendency of the disease by the use of emetics and drastic cathartics. But let us suppose that the trichinæ have already migrated to their usual habitat, the muscles; then all attempts to destroy the entozoa in these situations will be in vain. Notwithstanding the vaunted efficacy of such preparations as the *piro nitrite of potash*, *benzine*, *santonin*, *pancreatine*, etc., empiricism has taught us their utter incapacity. Nor must we suppose that death must inevitably follow the introduction of trichinæ into the economy, or even that infection must result, for it is known that almost every person can tolerate the presence of a limited quantity of trichinæ in the muscles without any appreciable reaction; as is repeatedly demonstrated on making necropsies by finding them in the muscles of individuals who, during life, have manifested no decided symptoms of trichinosis.

Two objects are to be attained in the prevention of trichinosis: to guard against infection from the ingestion of trichinised meat, and to prevent the dissemination of the disease among swine. To accomplish the former object, no pork or its various preparations should be eaten without having been previously submitted to a thorough microscopical examination for trichinæ. Laws should be enacted rendering such an examination obligatory. In this respect most stringent laws have been established in Germany, tending, as far as all scientific accuracy is concerned, to protect the people from infection. It has been proven by accurate statistics that since the inauguration of this obligatory microscopical examination (*trichinenschau*) in that country, the epidemics of trichinosis have not only been decreased in number, but even in sporadic cases the severity of infection has been materially mitigated. It is likewise true that such an examination does not always yield positive results, especially in those instances where the trichinæ are few in number; but this certainly is no argument by which this obligatory microscopical examination might be opposed.

A few of the laws governing the inspection of swine in Germany can be briefly detailed. Three officials are appointed by the municipal authorities for such a purpose, viz.: the Superintendent of Inspection (*Fleischschau Vorsteher*), Meat Inspector (*Fleischbeschauer*), and an individual whose duty it is to extract the necessary samples of meat, whom we shall call the Sample Taker (*Probennehmer*). No hog butchered within the municipal boundaries can be removed from the slaughter-house without having been first submitted to a microscopical examination and declared free

from trichinae. Within twelve hours after slaughtering the animal it must be reported to the Superintendent, who directs to the locality a Sample Taker, who personally extracts pieces of muscle from the following situations: diaphragm, abdomen, thorax, and larynx. These specimens he packs in a suitable case adapted for this purpose. The muscles primarily invaded are the diaphragm, intercostal, cervical, ocular, and laryngeal muscles. The only striated muscle exempt from the invasion is the heart. In the muscles of the extremities the trichinae are less abundant in direct proportion as we recede from the trunk. They are usually found at the tendinous attachments of the muscles, which is explained by the fact that owing to the comparative density of the tendons, their tendency to wander is prevented. The Inspectors are well versed in the preceding facts, and practically apply their theoretical learning in the pursuit of their profession, for in Germany it constitutes a distinct means of livelihood. After the samples are returned to the Superintendent's office, at least six sections of each sample are made, and all are carefully examined with the microscope. Should the meat be found to contain no trichinae, then a certificate to that effect is issued and the hog receives the official stamp. Should the contrary be the case, then the hog is condemned and disposed of as follows: It is subjected for at least twelve hours to a temperature of 120° C. After this thorough cooking process is accomplished, the fat can be used for any purpose, at the option of the owner, but the meat, bones, and viscera only for fertilizing purposes. The vessels used in cooking condemned animals must be kept in a thoroughly isolated situation. All the details enumerated must be recorded in suitable books kept for this purpose, and always open for inspection to the proper authorities. It will suffice to say that any dereliction of duty on the part of the Inspectors or owners in implicitly following the strict letter of the law, is severely punished.

The methods in vogue for the examination of trichinized meat are various, and will depend in many instances on contingencies. Only in the minority of instances can the microscope be dispensed with, and then only when the trichinae have become encysted and infiltrated with calcareous salts. Under such conditions they are visible to the unaided eye. Hartnaek has specially constructed microscopes for the examination of trichinae, and are used almost exclusively by the professional meat inspectors in Germany. When special occasions require, the muscular tissue can be extracted from the living animal, either by directly cutting down to the tissue or by harpooning. The specimen obtained in either way is carefully teased on an object-glass, after the addition of a few drops of a one per cent solution of sodium chloride. Examining sausage and other preparations of pork for trichinae is a more difficult procedure, and an inordinate amount of patience is often required.

Only recently I had occasion to examine some sausage, sent to me by Dr. William S. Groton, of Susanville, which he suspected contained trichinae, inasmuch as certain members of a family were afflicted with a train of symptoms resembling trichinosis. The microscope sustained the doctor's diagnosis, and in this instance, although two hundred sections were made with the microtome, in only eight per cent of all the sections examined could trichinae be found. Dr. Tyrrell has since then kindly sent me a piece of the same sausage, containing trichinae in about fifty per cent of all the sections examined. This case I deem to be of historical importance in California, and I am assured by Dr. Groton that it will receive publication.

The next step in the prophylaxis of this disease will enter into a brief consideration of the precautionary measures adopted by individuals against infection. Meat should not be eaten without having first undergone



a thorough cooking process. An argument usually urged in behalf of thorough cooking is, that in those countries where the inhabitants partake largely of raw meat trichinosis is more prevalent. But this is not the only factor concerning the etiology of the disease in question, inasmuch as the hog in different countries is infected in a greater or less degree; *e. g.*, in Switzerland, France, and England, trichinosis in man and animals is rare. Cooking in order to effectually render trichinized meat inert must be very thorough, for, according to the experiments of Fiedler and others, such meat when exposed for many hours to a temperature of 160° F. was in many instances incapable of killing the entozoa. Trichinosis is less frequent in northern than in southern Germany, owing no doubt to the more thorough cooking process by which meat is prepared in southern Germany.

Vallin has recently demonstrated that the encysted are more difficult to kill than the free trichinae. He also determined that after boiling about three pounds of meat for one hour, the interior of the meat attained a temperature of 122° F., and only after three hours further boiling, 212° F. The experiments of Gibier prove that extreme cold will likewise destroy the trichinae. Salting and drying of trichinized meat does not always militate against infection, however thoroughly done. Krabbe found that when ham containing trichinae was introduced into a five and one half per cent solution of sodium chloride, they were found to be alive fifteen days after, and other observers record a much longer time. To prevent the dissemination of the disease among swine, it is necessary to provide for almost pedantic cleanliness in maintaining the abode of these animals in a proper sanitary condition. They should be fed on the most cleanly food, and provision must be made against the abominable custom of allowing them to be fed on the bodies of dead swine, a custom so prevalent in America. Under such circumstances, a more potent means of transmitting infection could not be devised.

It would be folly to resent the recent action of the German Government, in prohibiting the importation of pork and its various preparations from America, when viewed in a thoroughly scientific light. The following statistics need no comment: In 1877, Eulenberg examined two million fifty-seven thousand two hundred and seventy-two slaughtered swine in Prussia with the view of ascertaining the extent of trichinosis among them. Only seven hundred and one were infected, *i. e.*, about 0.04 per cent. Billings, in 1880, with a like object in view, examined in Boston, two thousand seven hundred and one, and found one hundred and fifty-four infected, *i. e.*, 5.7 per cent.

Rats infesting the localities occupied by swine should be strenuously exterminated. How the hog becomes infected is a question often discussed, and it would seem rather difficult, in the present state of our knowledge, to arrive at any positive conclusion. A few competent observers maintain that trichinosis is only peculiar to the hog, and that infection among swine is the result of the healthy animals consuming the excrement of the infected ones. Other authors dissent from this view, and as strongly contend that the rat is the primitive host of the trichina. As is known, swine often feed on rats, and it is claimed that in this way the former animals become infected. Still other observers maintain that trichinosis in the rat is due to its consuming the dung of infected swine. The more recent authorities hold the view that the rat infects the hog, without wholly denying the possibility of the transmission of infection from one hog to another. It is to be sincerely hoped that State protection will be afforded the laity against the invasions of this dread disease, and that popular treatises will be distributed, and lectures instituted among them, in reference to trichinosis. Thus science will achieve her greatest triumph—the prevention of disease.

## SEASONAL RAINFALL—1885-86.

(Compiled by LIEUT. W. A. GLASSFORD, Signal Corps, U. S. A., Assistant in charge Pacific Coast Division, Signal Service.)

Table showing the Rainfall and Melted Snow for each Month during Season 1885-86.

STATIONS.	County.	July	August	September	October	November	December	January	February	March	April	May	June	Total	Names of Observers.
<i>California.</i>															
Crescent City	Del Norte	.00	.00	1.96	3.77	31.93	26.26	18.28	8.19	9.00	8.59	1.50	.11	109.59	D. S. Sartwell.
Yreka	Siskiyou	.58	.49	.29	6.98	2.10	2.16	4.03	.91	.74	1.76	1.79	.03	30.98	Dr. Louis Autenreith.
Fort Jones	Siskiyou	1.16	.01	.83	.53	3.26	7.92	7.92	1.32	1.33	2.20	1.44	.78	25.44	J. Titcomb.
Fort Bidwell	Modoc	.38	.00	.10	.73	8.22	3.74	5.91	1.22	.72	2.20	1.44	.78	25.44	Dr. Geo. M. Kober, U. S. A.
Orleans	Humboldt	.00	.00	.00	.96	18.82	9.73	11.61	2.41	3.45	8.93	1.69	.00	57.00	Henry P. Scott.
Fort Gaston	Humboldt	.12	.00	.96	.31	24.51	11.56	15.02	5.29	2.38	9.23	2.64	.00	72.05	Dr. H. I. Raymond, U. S. A.
Blue Lake	Humboldt	.00	.00	.93	1.65	31.99	13.73	16.52	6.30	6.51	12.97	2.83	.00	93.43	I. H. Blake.
Hydesville	Humboldt	.00	.00	1.05	1.12	18.37	9.31	8.73	3.56	3.13	9.15	1.28	.00	55.70	E. T. Foss.
Cape Mendocino	Humboldt	.32	.82	1.59	1.11	7.34	2.71	4.61	1.37	2.08	5.43	.35	.04	27.77	Signal Service, A. P. Leavitt.
Humboldt	Humboldt	.00	.00	1.57	1.55	13.56	7.00	5.93	1.97	3.15	6.53	1.18	.00	42.44	L. H. Dep't, W. J. Humphreys.
Trinity	Humboldt	.00	.00	.44	.11	16.56	6.78	8.71	.80	2.94	10.19	8.16	.00	75.24	Geo. E. Noonan.
Weaverville	Shasta	.00	.00	.00	.60	29.38	12.91	9.95	.50	3.52	8.41	2.32	.00	41.83	S. P. R. R., G. M. Taylor.
Delta	Shasta	.00	.00	.00	.00	11.90	9.00	10.30	—	2.90	5.42	2.15	.00	41.83	S. P. R. R., M. J. Sweeney.
Redding	Shasta	.00	.00	.00	.00	11.90	9.00	10.30	—	2.90	5.42	2.15	.00	41.83	Dr. Albert Fouch.
Anderson	Shasta	.00	.00	.00	.00	11.90	9.00	10.30	—	2.90	5.42	2.15	.00	41.83	T. R. Sanders.
Susanville	Lassen	.00	.00	.00	.00	11.90	9.00	10.30	—	2.90	5.42	2.15	.00	41.83	Sig. Service, R. L. Sebastian.
Red Bluff	Tehama	.05	.00	2.91	.10	17.05	3.85	4.85	.18	1.31	4.12	.73	.00	35.16	S. P. R. R., W. P. Ferguson.
Tehama	Tehama	.00	.00	.48	.00	10.42	3.00	4.08	.00	.98	4.00	.18	.00	23.14	S. P. R. R., W. T. Jewell.
Corning	Tehama	.00	.00	.00	.00	10.42	3.00	4.08	.00	.98	4.00	.18	.00	26.92	S. P. R. R., H. B. Davidson.
Chico	Butte	.00	.00	.30	.27	8.99	5.49	5.17	.75	2.29	4.17	.36	.00	26.99	Captain Hiram Arents.
Orville	Butte	.00	.00	.20	.00	11.27	5.53	4.44	.36	2.70	5.48	.50	.00	31.21	S. P. R. R., J. R. Ballard.
Orland	Colusa	.00	.00	.22	.00	9.41	3.03	4.45	.50	1.01	2.70	.64	.00	21.96	S. P. R. R., C. R. Wickes.
Willows	Colusa	.00	.00	.30	.30	3.37	4.01	.00	.35	2.45	.00	.00	.00	18.09	S. P. R. R., C. R. Wickes.
Princeton	Colusa	.00	.00	.12	.60	7.21	4.78	3.91	.17	.92	3.53	.35	.00	21.59	David Bentley.
Little Stony	Colusa	.00	.00	.00	.27	13.29	3.51	3.72	1.04	1.10	3.89	.00	.00	41.13	C. M. Polley.
Font's Springs	Colusa	.00	.00	.00	.00	20	19.43	4.85	9.29	2.00	1.65	5.01	.00	41.13	John F. Fouts.
Colusa	Colusa	.00	.00	.02	.79	7.69	3.98	4.57	.20	.64	3.65	.20	.00	21.74	J. D. McNarry.
Williams	Colusa	.00	.00	.18	.70	6.51	3.10	3.83	.00	.89	3.01	.00	.00	18.22	S. P. R. R., Geo. A. Stone.
College City	Colusa	.00	.00	.05	.91	8.79	3.55	1.64	.01	.00	.00	.00	.00	18.22	Dr. Albert Fouch.
Laytonville	Mendocino	.00	.00	.04	1.07	18.91	7.45	9.35	.30	3.43	.00	.00	.00	42.44	Remington and Viers.

Westport	00	1.70	1.67	19.75	7.50	5.79	1.35	3.81	7.77	2.53	1.00	31.42	E. S. S. Root, M.D.
Mendocino	00	2.07	2.40	24.31	10.70	10.50	1.51	4.71	10.73	2.07	1.00	42.00	Charles W. Deanslow.
Ukiah	00	15	53	19.21	5.13	9.74	23	2.96	6.17	4.98	1.00	45.69	George McCowen, D.D.S.
Point Arena	00	57	99	15.61	9.90	7.70	1.19	5.61	7.47	1.70	1.00	50.87	At. H. Dept., J. C. Ryan.
Marysville	00	—	—	8.23	3.36	3.36	.55	1.45	3.36	1.23	1.00	22.53	S. P. R. R., G. H. Baird.
Nevada City	00	1.62	1.00	21.55	6.77	13.66	1.54	6.92	12.19	1.23	1.00	69.78	J. E. Brown.
Truckee	00	25	47	10.95	7.08	7.08	.50	2.90	1.78	1.00	.56	23.31	S. P. R. R., F. Champlin.
Nevada	00	1.26	—	24.96	8.65	17.84	2.99	7.24	13.22	3.20	1.00	79.37	W. H. Radford.
Bowman's Dam	00	1.05	.60	2.40	2.53	8.35	.85	.41	1.30	.50	1.00	10.27	S. P. R. R., Jas. H. Lanyon.
Boca	00	2.05	—	19.27	6.36	12.40	1.43	4.83	11.38	1.69	1.00	59.11	W. Lantzheiser.
Grass Valley	00	2.55	—	20.23	7.98	13.49	1.78	2.18	12.26	1.15	1.00	61.62	W. H. Radford.
North Bloomfield	00	18	.56	7.45	3.65	4.75	.70	1.25	4.19	—	—	—	A. S. Noyes.
West Butte	00	—	—	9.34	5.03	5.32	.49	1.50	4.33	.45	1.00	26.76	A. Penleton.
Nicasius	00	—	23	15.37	3.51	5.61	1.36	2.00	1.30	.61	1.00	29.99	J. K. Jean.
Kono Tayee	00	.15	.51	19.42	6.60	13.61	.32	1.71	8.05	1.64	1.00	52.01	Leon Lobe.
Middletown	00	.53	—	18.69	7.38	18.28	1.97	6.90	11.94	2.73	—	68.12	S. P. R. R., Geo. Slusher.
Emigrant Gap	00	.50	—	17.05	4.87	14.55	2.40	7.40	7.50	1.45	1.00	55.72	S. P. R. R., J. P. McCloud.
Cisco	00	.95	—	13.03	3.00	13.90	1.40	7.80	6.40	.45	1.00	47.10	S. P. R. R., H. Wales.
Summit	00	.92	—	15.18	6.77	12.17	.34	3.69	10.86	1.08	1.00	51.91	S. P. R. R., L. Richardson.
Colfax	00	.61	—	15.24	4.05	8.25	.90	4.10	9.38	.65	1.00	42.31	S. P. R. R., Mrs. Geo. Willmont.
Auburn	00	.03	—	9.32	3.96	5.84	.31	3.61	4.61	.10	1.00	27.81	S. P. R. R., James Waddell.
Rocklin	00	.80	—	11.40	7.00	9.80	.50	5.10	2.30	.00	1.00	39.90	S. P. R. R., Allen Towle.
Towles	00	.16	—	21.77	7.03	18.32	1.16	7.75	15.04	1.76	.06	73.08	C. M. Fitzgerald.
Georgetown	03	1.16	—	15.37	5.22	13.03	1.15	5.22	11.75	1.21	.50	54.63	Samuel Hale.
Placerville	00	.55	—	10.77	4.99	10.77	.69	3.84	9.51	.71	—	42.08	M. Phelps.
Shingle Springs	00	.05	1.45	10.17	3.68	8.37	.90	1.69	3.61	.18	1.00	29.50	S. P. R. R., D. R. Nason.
Dunsmuir	00	.05	—	7.87	4.56	5.32	.20	1.70	4.75	.05	1.00	21.50	S. P. R. R., J. H. Sproule.
Yolo	00	.20	—	8.70	3.75	4.78	.00	1.31	4.10	.00	1.00	22.84	S. P. R. R., P. W. Phillips.
Woodland	00	.00	—	8.74	4.71	5.95	.14	1.77	3.90	.16	1.00	25.40	S. P. R. R., G. W. Yount.
Winters	00	.00	—	8.00	4.43	5.53	.00	1.37	4.25	.00	1.00	24.08	S. P. R. R., Geo. R. Crawford.
Knights Landing	00	.12	.78	15.67	5.36	9.89	—	2.23	7.12	1.05	1.00	41.72	S. P. R. R., Harry Stone.
Calistoga	00	.05	.61	8.51	4.35	8.09	.00	1.81	4.12	.38	1.00	28.22	S. P. R. R., E. Bonnell.
Napa	00	.05	—	13.40	4.46	7.84	.28	1.38	7.09	.20	1.00	34.74	Robert Hall.
Sonoma†	00	.01	.86	11.33	3.25	6.09	.18	2.30	4.17	.54	1.00	29.67	S. P. R. R., J. Singley.
Petaluma	00	.00	—	8.45	2.17	5.15	.07	2.40	6.06	.84	1.00	25.11	S. P. R. R., W. Mohrery.
Ione	00	.23	—	12.80	2.78	7.97	.75	4.51	8.04	—	1.00	35.01	Richard Webb.
Jackson	00	.21	—	10.91	4.88	7.60	.90	3.15	6.78	.29	1.00	32.97	Signal Service, J. H. Sturges.
Polsom	.02	—	—	11.34	5.76	7.95	.29	2.68	4.08	.07	1.00	22.97	Signal Service, J. A. Barwick.
Sacramento	00	.08	.02	7.76	2.34	5.19	.07	3.05	4.16	.10	1.00	22.97	S. P. R. R., D. H. Chippenger.
Brighton	00	.00	—	5.56	2.33	6.04	.00	1.69	3.58	.15	1.00	19.35	S. P. R. R., J. A. Sampson.
Galt	00	.00	—	7.58	4.49	6.31	.00	.84	—	—	1.00	—	L. C. Taylor.
Batavia	00	.31	—	4.03	4.03	8.04	1.35	1.35	4.22	.14	1.00	—	S. P. R. R., H. T. Shirley.
Elmira	00	.00	—	15.98	5.08	8.74	.17	1.32	4.81	.05	1.00	37.08	A. V. Stevenson.
Vacaville	00	.30	—	15.98	5.08	8.74	.17	1.32	4.81	.05	1.00	37.08	A. V. Stevenson.

†Season to January 31st.

\* Began November 1st.

## SEASONAL RAINFALL—Continued.

STATIONS.	County.	July	August	September	October	November	December	January	February	March	April	May	June	Total	Names of Observers.
Suisun.....	Solano	.00	.00	.05	.22	10.38	4.43	8.18	.00	1.87	4.02	.15	.00	29.36	W. H. Wilbur.
Denverton.....	Solano	.00	.00	.03	.22	7.02	3.22	7.31	.16	1.51	3.45	.24	.00	23.76	Dr. S. K. Nurse.
Rio Vista.....	Solano	.00	.00	.00	.00	7.95	3.30	7.32	.15	1.67	3.37	.00	.00	23.77	J. C. Stanton.
South Vallejo.....	Solano	.00	.00	.00	.50	7.07	4.30	6.25	.00	2.20	4.82	.22	.00	26.16	S. P. R. R., J. N. Rhorer.
Bird's Landing.....	Solano	.00	.00	.00	.10	6.17	2.17	4.92	1.73	3.04	2.95	.00	.00	18.38	M. Dinkelspiel.
Benicia.....	Solano	.00	.00	.02	.30	8.75	5.85	5.98	.07	2.28	4.76	.14	.00	28.16	Dr. C. K. Winne, U. S. A.
Angel Island.....	Marin	.02	.00	.08	.43	11.57	4.64	7.17	.12	1.75	5.43	.35	.00	31.76	Dr. L. N. Clark, U. S. A.
Sausalito.....	Marin	.00	.00	.00	.45	12.05	3.37	7.85	.00	2.18	5.21	.53	.00	32.33	G. Tashera.
Point Reyes.....	Marin	.00	.00	.00	.13	6.71	1.38	4.05	.13	.00	2.53	.35	.00	16.48	L. H. Dept't, E. G. Chamberlin.
Point Bonita.....	Marin	.00	.00	.00	.84	9.22	4.56	8.37	.79	1.20	3.98	.59	.00	26.55	Lighthouse Dept't, J. B. Brown.
San Rafael.....	Marin	.00	.00	.00	.37	10.78	6.88	12.26	.28	3.62	6.53	.73	.00	41.45	U. M. Gordon.
Ross Valley.....	Marin	.00	.00	.03	.70	15.21	6.69	11.08	.28	3.12	8.30				William McPherson.
Martinez.....	Contra Costa	.00	.00	.05	.15	8.08	4.11	5.39	.05	1.53	3.44	.25	.00	23.01	S. P. R. R., J. H. Borland.
Antioch.....	Contra Costa	.00	.00	.00	.00	4.87	2.19	3.60	.00	.56	2.03		.00	13.25	S. P. R. R., S. C. Crilley.
Brentwood.....	Contra Costa	.00	.00	.00	.00	6.40	2.58	4.16	.03	1.51	2.08	.00	.00	16.76	S. P. R. R., H. A. Graves.
Byron.....	Contra Costa	.00	.00	.00	.00	6.70	2.01	4.09	.00	1.79	2.23	.00	.00	16.85	S. P. R. R., W. J. Casselman.
East Brother Lighthouse.....	Contra Costa	.00	.00	.00	.50	5.13	1.71	1.50	.00	.99	1.15	.14	.00	11.12	L. H. Dept't, G. F. Winsor.
Oakland.....	Alameda	.02	.00	.05	.30	11.11	4.33	8.12	.30	2.57	5.11	.30	.00	32.21	Dr. J. B. Tremblay.
Niles.....	Alameda	.00	.00	.00	.35	8.78	1.92	6.17	.63	1.72	4.18	.18	.00	23.43	S. P. R. R., Wm. Mortimer.
Livermore.....	Alameda	.00	.00	.05	.00	6.56	1.94	4.20	.24	1.18	2.36	.00	.00	16.53	S. P. R. R., J. S. Mitchell.
Pleasanton.....	Alameda	.00	.00	.00	.05	7.33	2.17	4.25	.29	1.34	3.08	.39	.00	18.90	S. P. R. R., U. A. Boydston.
Oakland.....	Alameda	.00	.00	.02	.38	9.73	4.36	6.77	.30	2.00	3.90	.19	.00	24.75	S. P. R. R., T. E. Hunt.
Stockton.....	San Joaquin	.00	.00	.00	.00		.74	4.36	.05	1.00	3.25	.00	.00		S. P. R. R., K. A. White.
Farmington.....	San Joaquin	.00	.00	.00	.00	6.35	1.37	4.29	.41	1.87	5.01	.19	.00	20.00	S. P. R. R., H. C. Frost.
Lathrop.....	San Joaquin	.02	.00	.00	.00	6.46	.99	3.51	.01	1.08	2.46	.00	.00	14.53	S. P. R. R., W. C. Budge.
Tracy.....	San Joaquin	.00	.00	.00	.00	5.69	.85	2.55	.35	1.40	1.55	.10	.00	12.00	S. P. R. R., C. M. Wooster.
LaGrange.....	Stanislaus	.00	.00	.00	.00	10.60	1.48	3.79	.32	3.24	4.56		.00	24.09	Dr. Joseph Dominici.
Langworth.....	Stanislaus	.00	.00	.00	.00	8.12	1.90	4.74	.08	2.53	4.78	.10	.00	22.55	A. Gardner.
Modesto.....	Stanislaus	.00	.00	.00	.00	5.03	.85	2.60	.10	1.46	2.79	.00	.00	12.85	S. P. R. R., J. T. Keating.
Turlock.....	Stanislaus	.00	.00	.00	.00	6.63	1.10	2.52	.08	1.75	3.01	.00	.00	15.09	S. P. R. R., E. W. Pierce.
Hill's Ferry.....	Stanislaus	.00	.00	.00	.00	6.90	1.10	3.81	.00	2.05	2.66	.00	.00	16.53	Dr. C. P. Miller.
Alcatraz Island.....	San Francisco	.02	.00	.12	.50	10.01	3.47	7.00	.15	1.52	4.20	.25	.00	27.27	Dr. Robt. J. Gibson, U. S. A.
Fort Mason.....	San Francisco	.00	.00	.00	.42	10.70	5.94	4.28	.00	1.71	5.08	.20	.00	28.36	Dr. J. M. Dickson, U. S. A.
Yerba Buena L. H.....	San Francisco	.00	.00	.00	.84	9.22	4.56	8.37	.79	1.20	3.38	.39	.00	29.55	Lighthouse Dept't, G. B. Koons.
Presidio of S. F.....	San Francisco	.00	.00	.08	.46	8.74	4.35	6.77	.10	1.92	4.89	.20	.00	27.48	Dr. H. R. Tilton, U. S. A.
San Francisco.....	San Francisco	.05	.00	.11	.72	11.78	4.99	7.42	.24	2.07	5.28	.37	.01	33.05	Sig. Serv., Nelson Gorom.
Farrallones L. H.....	San Francisco	.00	.00	.04	.81	11.12	3.20	4.31	.41	2.31	3.52	.37	.00	26.15	Lighthouse Dept't, T. Owen.

San Mateo.....	San Mateo.....	00	00	02	13	6.88	2.34	6.20	3.35	2.28	4.50	15	00	22.85	S. P. R. R., B. A. Peekham.
Menlo Park.....	San Mateo.....	00	00	02	09	6.22	2.17	4.97	3.37	1.65	3.34	08	00	18.91	S. P. R. R., C. F. Parker.
Woodside.....	San Mateo.....	00	00	07	12	11.46	4.71	9.72	00	2.60	7.26	86	00	37.40	..... C. H. Halsey.
Point Montara L. H.....	San Mateo.....	00	00	00	16	10.98	3.17	5.60	26	3.43	4.42	39	00	28.41	Lighthouse Dept., C. C. Linne.
Pigeon Point L. H.....	San Mateo.....	07	00	15	02	3.62	1.28	4.59	62	2.36	5.20	45	00	18.36	Lighthouse Dept., C. B. Grass.
Año Nuevo L. H.....	San Mateo.....	00	00	00	40	7.87	2.45	5.16	91	1.61	4.15	18	00	23.36	Lighthouse Dept., I. Hodgson.
Santa Cruz.....	Santa Cruz.....	08	00	07	10	10.25	2.90	7.60	80	3.05	7.60	30	00	32.75	S. P. R. R., H. J. Emley.
Apitos.....	Santa Cruz.....	18	00	07	02	10.65	3.83	7.61	80	4.09	7.33	27	00	31.85	S. P. R. R., Thos. D. Wakelee.
Santa Clara.....	Santa Clara.....	00	00	01	06	7.58	00	6.09	32	1.17	4.32	22	00	21.31	Dr. A. W. Saxe.
Gilroy.....	Santa Clara.....	05	00	00	06	6.77	6.61	11.30	134	2.82	7.12	43	00	43.02	S. P. R. R., C. S. Green.
Los Gatos.....	Santa Clara.....	00	00	00	06	5.81	1.08	2.64	10	1.94	2.85	00	00	14.43	F. H. McCulloch.
Merced.....	Merced.....	00	00	00	00	5.82	1.08	2.64	10	1.94	2.85	00	00	14.43	S. P. R. R., W. M. Sell.
Los Baños.....	Merced.....	00	00	00	00	6.24	1.08	2.64	10	1.94	2.85	00	00	14.43	A. Wideman.
Central Point.....	Merced.....	00	00	00	00	7.01	1.08	2.64	10	1.94	2.85	00	00	14.43	H. G. Heydemann.
Borden.....	Fresno.....	00	00	00	00	8.69	1.08	2.64	10	1.94	2.85	00	00	14.43	S. P. R. R., B. A. Woodruff.
Fresno.....	Fresno.....	00	00	00	00	7.92	1.08	2.64	10	1.94	2.85	00	00	14.43	S. P. R. R., J. H. Smith.
Firebaugh Ferry.....	Fresno.....	00	00	00	00	9.91	1.08	2.64	10	1.94	2.85	00	00	14.43	S. P. R. R., Wm. Sheridan.
Lemoore.....	Fresno.....	00	00	00	03	8.16	1.20	3.16	22	1.21	3.35	00	00	17.31	S. P. R. R., W. J. McFee.
New Idria.....	Fresno.....	00	00	00	00	8.81	1.20	3.16	22	1.21	3.35	00	00	17.31	Thos. N. Williams.
Kingsburgh.....	Fresno.....	00	00	00	10	6.22	2.44	2.04	24	1.03	2.45	00	00	14.52	S. P. R. R., Geo. A. Leon.
Bishop Creek.....	Inyo.....	00	00	00	02	00	00	00	00	00	00	00	00	00	C. & C. R. R., H. A. Man.
Keeler.....	Inyo.....	00	11	00	25	66	36	49	00	63	40	00	00	2.90	Sig. Serv., Jno. Grover.
Hollister.....	San Benito.....	27	00	00	00	4.91	1.12	3.93	55	1.29	2.55	15	00	14.87	S. P. R. R., W. C. Johnson.
Salinas.....	Monterey.....	09	00	00	08	6.37	1.17	5.18	116	2.16	4.03	08	00	20.32	S. P. R. R., J. H. Foster.
Chumlar.....	Monterey.....	07	00	00	17	6.90	1.41	2.80	110	1.30	2.20	07	00	16.27	S. P. R. R., Thos. F. Paw.
Monterey.....	Monterey.....	00	00	00	08	6.65	1.73	3.09	126	2.84	3.39	08	00	19.12	S. P. R. R., F. D. Howard.
Soledad.....	Monterey.....	00	00	00	20	6.22	1.02	2.44	130	1.60	1.93	00	00	14.70	S. P. R. R., J. P. Villagas.
Pajaro.....	Monterey.....	13	00	00	00	7.91	4.08	6.01	47	3.20	5.25	04	00	27.18	S. P. R. R., F. P. Monk.
Gonzales.....	Monterey.....	00	00	00	00	6.34	1.22	3.01	138	1.38	1.91	00	00	15.24	Wm. Sables.
Salinas.....	Monterey.....	00	00	00	00	6.30	1.30	5.10	147	2.16	3.83	20	00	20.76	Dr. E. K. Abbott.
Traver.....	Tulare.....	00	00	02	08	6.60	1.77	1.90	47	1.06	2.01	00	00	00	S. P. R. R., J. W. Raymon.
Goshen.....	Tulare.....	00	00	00	05	4.24	1.43	1.71	43	1.06	1.67	00	00	10.62	S. P. R. R., L. Lawrence.
Visalia.....	Tulare.....	00	00	00	11	4.84	1.63	1.74	70	1.38	2.70	00	00	13.10	Tipton Lindsey.
Hanford.....	Tulare.....	00	00	00	00	8.46	1.27	2.93	00	1.00	2.38	00	00	16.75	S. E. Biddle.
Tulare.....	Tulare.....	05	00	00	06	3.36	1.48	1.41	151	80	1.94	00	00	9.25	S. P. R. R., H. H. Francis.
Lewis Creek (Lewis Val.).....	Tulare.....	00	00	00	04	4.56	1.94	1.82	51	1.76	2.49	00	00	13.12	John Tuohy.
San Luis Obispo.....	San Luis Obispo.....	02	00	02	07	12.90	3.68	5.79	81	2.42	3.87	00	00	29.58	Signal Service, Thos. Gibson.
Delano.....	Kern.....	00	00	00	15	3.10	1.60	1.75	20	1.54	1.94	00	00	8.44	S. P. R. R., D. L. Ceell.
Sumner.....	Kern.....	05	00	00	03	1.94	1.23	1.85	20	3.5	1.91	00	00	5.94	S. P. R. R., F. F. Whitmer.
Caliente.....	Kern.....	05	00	00	05	3.88	1.33	1.59	66	2.62	2.65	00	00	12.83	S. P. R. R., E. B. Love.
Keene.....	Kern.....	05	00	00	28	3.73	4.6	2.02	64	2.28	2.84	00	00	12.31	S. P. R. R., A. L. Woolsey.
Tehachapi.....	Kern.....	05	31	00	00	3.70	5.2	1.58	20	4.30	4.57	00	00	15.23	S. P. R. R., W. H. Knapp.
Mojave.....	Kern.....	71	00	00	00	1.25	1.16	1.49	00	1.22	1.54	00	00	9.66	S. P. R. R., H. H. Smith.
Colton.....	San Bernardino.....	00	00	00	00	1.92	5.2	2.78	40	3.34	5.0	00	00	00	S. P. R. R., W. S. Hooper.
San Bernardino.....	San Bernardino.....	00	00	00	39	4.36	1.20	6.44	2.52	2.33	3.01	00	00	20.25	Sydney P. Waite.

## SEASONAL RAINFALL—Continued.

STATIONS.	County.	July	August	September	October	November	December	January	February	March	April	May	June	Total	Names of Observers.
San Geronio	San Bernardino	00	00	00	02	1.34	1.62	2.97	1.73	3.07	1.24	00	00	9.60	S. P. R. R., Mrs. H. S. Austin.
Riverside	San Bernardino	00	00	00	17	5.20	.80	2.86	1.38	1.95	1.43	00	00	18.79	Albert S. White.
Ravenna and Southside	Los Angeles	02	00	00	00	9.01	2.25	5.30	.11	4.51	2.70	00	00	21.57	S. P. R. R., J. M. Gough.
Newhall	Los Angeles	00	00	00	00	7.91	1.17	6.70	3.11	4.27	3.39	00	00	28.96	S. P. R. R., C. L. Hedemark.
San Fernando	Los Angeles	00	00	00	00	6.32	2.50	10.05	2.55	2.74	4.50	00	00	25.95	S. P. R. R., J. J. Sheridan.
Alosta	Los Angeles	00	00	00	29	6.32	1.65	7.78	1.41	2.52	3.32	01	11	29.70	J. J. West.
Los Angeles	Los Angeles	05	30	05	30	5.55	1.65	7.65	1.21	2.61	3.00	00	00	23.63	Signal Service, G. E. Franklin.
Cahuenga Valley	Los Angeles	00	00	00	00	7.45	1.65	7.65	1.21	2.61	3.00	00	00	23.63	Seward Cole.
Anaheim	Los Angeles	00	00	00	00	2.93	1.16	4.63	.82	2.70	2.51	00	00	14.75	S. P. R. R., J. T. Gifford.
Santa Monica	Los Angeles	00	00	00	25	10.65	2.75	6.60	1.27	1.16	2.00	00	00	21.68	H. C. Townner.
Orange	Los Angeles	00	07	00	02	2.84	1.19	6.83	1.83	2.04	2.17	.08	00	17.07	John J. Bodkin.
Spadra	Los Angeles	00	12	00	00	2.72	.90	5.76	.45	2.80	2.85	00	00	16.50	S. P. R. R., C. H. Cloutman.
Nordhoff	Ventura	00	00	00	00	19.16	2.35	6.83	1.17	3.07	6.87	00	04	39.49	Captain Richard Robinson.
San Buenaventura	Ventura	00	00	00	03	8.33	1.03	6.36	1.04	2.27	1.47	.09	00	21.12	F. E. Brown, C. E.
Guadalupe	Santa Barbara	00	00	00	00	8.83	3.59	2.89	1.00	2.60	3.65	00	00	21.56	Thomas Saulsbury, Jr.
Santa Maria	Santa Barbara	00	00	00	00	8.78	1.63	1.85	.97	2.55	3.37	00	00	19.15	L. E. Blochman.
Point Conception	Santa Barbara	00	00	00	00	1.18	1.87	.99	1.22	1.96	.00	40	00	7.62	T. L. Perry, Lighthouse Dept.
Santa Barbara	Santa Barbara	00	00	00	19	9.84	2.47	4.62	1.19	2.03	3.40	00	00	23.74	Hugh D. Vail.
Indio	San Diego	00	00	00	00	.00	.00	.00	.00	.00	.00	00	00	.00	S. P. R. R., A. G. Tingman.
Fall Brook	San Diego	00	02	00	00	5.92	1.13	9.76	1.13	4.70	3.43	00	14	26.23	F. E. Fox.
Poway	San Diego	00	00	00	06	2.71	.90	6.34	.77	3.24	2.78	00	00	16.80	Adams Chapin.
Escondido	San Diego	00	00	00	00	4.68	.75	7.33	.80	4.71	2.60	00	00	20.87	Major G. F. Merriam.
San Diego	San Diego	00	13	00	31	1.56	.71	6.95	1.51	3.73	1.95	.01	06	16.95	Signal Service, J. C. Sprigg, Jr.
Mammoth Tank	San Diego	02	00	00	00	1.01	.57	.20	.25	.05	.05	00	00	2.70	S. P. R. R., J. F. Leiden.
Laguna Mts. (Ot'y Mesa)	San Diego	00	1.87	00	.44	2.71	.60	3.79	1.08	3.32	1.62	.02	00	15.45	Archibald Campbell.
Oregon.															
Astoria	Clatsop	04	02	4.21	3.44	12.45	9.85	13.24	5.69	7.23	4.99	3.65	2.05	60.89	Signal Service, J. N. Griffin.
Portland	Multnomah	24	00	2.48	1.68	8.52	7.17	9.33	1.96	5.39	3.16	1.32	.67	41.92	Signal Service, M. L. Hearne.
East Portland	Multnomah	04	00	1.13	1.15	4.01	4.13	5.08	3.04	3.04	3.04	1.08	.04	21.74	Dr. Geo. E. Wigg.
Albany	Linn	00	00	2.15	1.75	8.40	7.04	9.92	3.31	3.19	2.95	1.79	.36	40.89	John Briggs.
Eola	Polk	00	00	2.67	1.42	7.36	8.01	11.56	1.94	3.67	2.74	1.56	.58	38.84	Thos. Pearce.
Roseburg	Douglas	07	00	36	1.66	8.10	6.52	7.59	2.44	3.03	4.08	1.11	.13	35.99	Signal Service, B. S. Pague.
Empire City	Cass	00	00	35	2.43	12.80	8.35	9.05	5.10	4.17	3.08	2.21	.06	48.29	David Morse.
Bandon	Cass	00	02	2.32	1.45	18.21	13.27	13.72	5.65	5.81	4.63	1.10	.51	67.61	George Bennett.
Ashtland	Jackson	02	00	1.18	1.53	8.02	3.32	4.64	1.63	1.43	2.63	1.19	.72	26.31	Signal Service, F. Newman.
Linkville	Klamath	00	00	00	.76	3.76	2.35	5.31	1.21	1.53	1.50	1.37	1.18	18.97	Sig. Service, H. E. Wilkinson

Fort Klamath	00	1.35	.86	.43	7.29	4.06	7.30	1.17	3.69	2.77	1.12	.83	29.55	Signal Service, G. H. Willson.
Lakeview	25	.43	.02	.32	6.57	2.15	3.15	1.26	.95	1.32	.97	1.02	18.41	Sig. Service, E. C. Thompson.
Pendleton								.77		.53	1.05			Rev. C. A. Woody.
La Grange												.52		
Mount Angel												4.36		
<i>Washington Territory.</i>														
Tatoosh Island	22	.12	9.60	7.51	19.25	10.14	10.82	10.29	10.89	7.01	3.44	3.13	98.45	Signal Service, C. E. Butler.
Neah Bay	25	.05	12.15	7.95	19.00	13.00	16.40	14.10	12.90	7.55	4.40	3.70	112.05	Signal Service, Charles Adie.
Port Angeles	.03	.00	3.25	2.44	3.90	3.07	5.51	2.98	3.23	2.67	.77	.70	28.58	Signal Service, William Bell.
Fyshet	.26	.00	9.41	5.85	13.07	7.43	11.41	7.81	7.91	4.49	1.81	2.33	72.31	Signal Service, H. J. Carr.
Port Townsend	.09	.00	2.10	1.00	3.28	1.35	7.72	3.71	.51	1.58	.76	.21	19.03	Dr. J. D. Hall, U. S. A.
Blakely (Bainbridge Is.)	.82	.01	4.27	4.40	8.04	6.22	6.90	1.95	2.78	2.37	1.76	.41	39.91	J. M. Hoskinson.
Tacoma	.26	.00	2.45	2.47	8.22	6.01	7.71	2.29	3.35	3.67	1.81	1.03	39.33	Captain E. S. Fuller.
Thurston	1.10	.00	3.69	2.84	10.18	5.72	9.47	3.39	4.07	4.04	1.90	1.26	47.66	Sig. Service, Edgar McGovern.
Port Canby	.22	.12	3.43	3.48	13.72	10.56	6.33	4.77	8.26	5.41	3.43	2.07	62.43	Signal Service, J. D. Kurns.
Kenowick				.26	.99	1.03	2.10	.19						Captain A. W. Gray.
Pleasant Grove	.01	—	.39	.06	1.69	1.55	2.81	.30	.21	.98	.20	.07	8.33	George W. Parrish.
Walla Walla	.00	.02	.60	.70	1.60	1.92	3.45	1.29	1.06	1.66	.97	.73	13.70	Sig. Service, H. S. Blanford.
Spokane Falls	.00	.38	1.14	.80	4.25	1.81	3.12	.61	1.07	1.18	.92	.57	15.85	Sig. Service, J. F. Hemenway.
Fort Spokane	.00	.38	1.14	.03	2.07	.44	1.86	.41	.79	1.23	1.28	.91	10.57	Signal Service, H. W. Dodge.
<i>Nevada.</i>														
Carson City	.00	.10	.06	.12	4.73	1.75	5.57	.28	1.60	.25	.26	.05	14.77	Charles W. Friend.
Reno	.00	.00	.00	.00	1.55	.60	3.00	.20	.70	.00	.10	.00	6.15	S. P. R. R., H. W. Higgins.
Wadsworth	.00	.08	.05	.00	1.13	.49	1.62	.30	.85	—	—	—	4.52	S. P. R. R., C. H. Fairchild.
Hot Springs	.00	.00	.00	.00	1.54	.22	.95	.52	.30	.35	—	.16	4.04	S. P. R. R., R. D. Cassidy.
Winnemucca	.00	.01	.08	.07	3.78	1.00	.71	.40	.82	1.37	.14	.76	9.17	Signal Service, Chas. A. Reed.
Brown's	.00	.00	.00	.00	1.39	.55	.40	.7	.32	—	.00	.00	2.66	S. P. R. R., R. Jackman.
Humboldt	.03	.02	.00	.00	.62	.35	.85	.10	.40	.35	.00	—	2.72	S. P. R. R., H. J. Humphreys.
Gileconda	.00	.25	.05	.05	2.97	.30	.45	.02	.50	.80	.00	.52	6.11	S. P. R. R., W. R. Rich.
Battle Mountain	.00	.33	.00	.00	.72	1.06	1.29	.00	.67	1.72	.21	.21	6.33	S. P. R. R., James Brown.
Beowawe	.00	.39	.00	.00	1.18	.87	.78	.08	.35	.41	.22	.00	4.28	S. P. R. R., John Kerns.
Falsade	.00	.25	.20	.10	1.88	.60	.30	.51	.75	.28	.00	.10	5.00	S. P. R. R., J. N. Hill.
Carlin	.00	.25	.60	.17	2.17	.95	.213	.12	1.31	.32	.28	.21	8.64	S. P. R. R., J. A. McBride.
Halleck	.00	?	?	.00	1.64	1.07	.216	.43	1.00	.20	.74	.15	7.39	S. P. R. R., S. C. Pollock.
Elko	.00	.27	.28	.05	1.80	2.38	2.23	.21	1.39	.53	.21	.46	9.87	S. P. R. R., D. Washette.
Wells	.27	.70	.21	.18	1.10	.23	2.07	.20	.39	.47	.30	.20	5.35	S. P. R. R., G. P. Barnette.
Otoego*	.00	.35	.35	.03	1.45	.67	2.05	.40	1.45	.36	.228	.750	—	S. P. R. R., C. H. Jellers.
Toano	.00	.20	.20	.00	1.10	.40	1.00	.70	.80	.00	.00	.40	4.80	S. P. R. R., C. H. Gordon.
Tecoma	.00	.20	.20	.00	1.10	.40	1.00	.70	.80	.00	.00	.40	4.80	S. P. R. R., R. R. Powers.

\*Recommended January 1. (—) Too small to measure.

## MONTHLY AVERAGES OF RAINFALL ON THE PACIFIC COAST.

(Compiled by Lieut. W. A. Glassford, Signal Corps, U. S. A., Assistant in charge Pacific Coast Division, Signal Service.)

Table showing Monthly Rainfall Averages on the Pacific Coast, with Averages for Season, with Number of Years for which Averages are Determined, and Total Precipitation for 1885-86.

STATIONS.	County.	Elevation.	Number of Years	July	August	September	October	November	December	January	February	March	April	May	June	Average Season	Total—1885-6.
<i>California.</i>																	
Crescent City	Del Norte.	50	7	.65	.08	3.19	10.22	11.37	18.90	13.09	10.44	6.29	8.58	2.75	2.31	88.77	100.59
Fort Terwah	Del Norte.	—	4	.72	.01	4.57	4.52	12.71	11.52	9.97	8.78	4.51	6.07	3.63	.18	69.59	—
Camp Lincoln	Del Norte.	—	3	.03	.51	.50	1.82	9.48	15.58	10.87	6.68	11.20	7.16	.32	3.12	73.41	—
Yreka	Siskiyou	2,635	14	.30	.13	.31	1.28	2.05	2.78	3.21	1.76	1.35	1.04	1.10	.54	15.85	30.98
Fort Jones	Siskiyou	2,570	27	.43	.18	.42	1.21	3.23	4.90	4.84	2.94	2.57	1.84	.98	.46	21.00	23.78
Fort Bidwell	Modoc	4,647	20	.25	.21	.43	1.08	2.20	3.20	3.00	2.31	1.86	1.50	1.25	1.08	19.15	57.00
Orleans	Humboldt	—	2	.00	.00	.00	.96	9.49	11.16	8.66	3.78	2.15	5.70	1.92	.46	43.38	—
Fort Gaston.	Humboldt	397	22	.14	.12	.97	2.82	8.15	10.51	10.39	7.91	7.61	5.02	1.64	.72	59.19	72.05
Blue Lake (Christmas Prairie)	Humboldt	—	3	.02	.01	1.16	1.23	6.91	8.82	5.91	3.76	3.47	5.73	.93	.54	38.49	43.43
Hydesville	Humboldt	637	4	.38	.29	1.10	1.58	2.88	2.60	2.08	1.89	1.90	3.15	.74	.82	19.50	27.77
Cape Mendocino	Humboldt	—	7	.03	.01	.88	2.07	4.40	5.58	6.28	4.64	4.46	3.56	1.08	.36	33.38	42.44
Humboldt	Humboldt	50	5	.13	.05	.51	2.85	5.95	7.71	8.21	5.75	4.77	3.83	1.75	.93	42.50	—
Weaverville	Trinity	2,162	12	.05	.08	.28	5.50	9.40	9.34	7.36	1.90	7.35	9.44	5.38	2.18	39.19	73.24
Delta	Shasta	—	5	.06	.00	.42	2.31	4.41	6.38	7.53	4.17	4.53	3.71	1.51	.52	36.66	41.83
Redding.	Shasta	545	12	.06	.08	.66	1.07	2.82	4.37	3.16	3.76	3.52	1.40	1.25	.64	23.18	—
Ft. Crook.	Shasta	3,390	9	.32	.01	.70	1.28	3.85	5.19	5.47	3.63	2.91	2.93	1.08	.37	27.46	35.16
Red Bluff	Tehama	332	9	.02	.03	.20	1.22	2.38	2.66	2.81	2.06	2.24	1.89	.51	.00	15.03	23.14
Tehama	Tehama	220	16	.06	.07	.20	1.13	1.10	2.05	3.45	2.06	2.24	1.89	.51	.00	15.03	26.92
Corning.	Tehama	—	9	.00	.00	.29	1.10	1.12	1.12	13.08	12.33	10.71	7.56	2.96	.57	65.81	—
Munford Hill.	Plumas	—	6	.14	.32	.69	2.23	4.10	11.12	13.08	12.33	6.21	3.20	1.80	1.00	57.04	—
Meadow Valley	Plumas	—	4	2.40	1.13	1.53	2.41	12.10	11.52	7.41	6.05	6.21	3.20	1.80	1.00	57.04	26.00
Chico	Butte	196	16	.03	.03	.32	1.43	2.48	3.78	4.12	3.44	2.50	1.69	.76	.26	20.84	26.00
Oroville	Butte	205	4	—	.00	.71	.81	3.12	7.51	4.11	1.66	1.32	2.42	.29	.10	22.11	31.21
Cherokee	Butte	—	13	.11	.06	.54	2.95	5.40	6.59	8.37	7.55	7.45	3.37	1.47	.60	44.63	21.96
Orland	Colusa	254	8	.00	.00	.32	.72	2.42	3.49	1.84	1.84	2.12	1.76	.74	.16	12.03	18.09
Willows.	Colusa	132	8	.01	.01	.56	1.70	1.69	2.67	2.32	1.02	1.32	1.53	.55	.45	15.25	21.59
Princeton	Colusa	67	13	.03	.03	.23	1.10	1.69	2.68	3.17	1.95	1.72	1.53	.55	.45	15.25	21.59
Colusa	Colusa	45	15	.04	.02	.19	1.04	1.82	3.17	3.67	2.82	1.86	1.54	.45	.37	16.00	21.74
Williams	Colusa	89	10	—	.01	.19	.46	1.37	2.17	2.77	1.47	1.34	1.52	.42	.37	12.69	18.22



College City	3	00	—	37	.80	3.07	3.07	2.30	.91	3.01	1.02	.08	1.12	16.35
Lafayette	2	92	00	.34	1.06	10.16	6.73	2.45	3.29	4.98	.24	.31	37.61	---
Mendocino	2	00	00	1.76	19.75	7.50	4.21	2.87	4.11	1.32	.31	37.61	31.93	---
Mendocino	60	05	03	2.57	7.28	8.26	9.92	8.90	7.36	4.50	1.36	.40	51.21	69.00
Mendocino	10	00	01	4.18	1.43	3.91	6.21	6.88	4.78	1.57	.98	.12	32.92	15.69
Camp Wright	10	00	01	4.18	1.43	3.91	6.21	6.88	4.78	1.57	.98	.12	32.92	15.69
Point Arena	8	02	00	39	1.37	3.81	6.12	4.29	3.24	3.91	1.06	.76	29	28.11
Marysville	69	01	01	2.22	1.10	1.85	3.43	3.31	2.23	1.89	1.61	.00	.31	16.00
Smartsville	10	05	00	.11	3.71	5.01	7.11	5.70	3.46	.88	.44	32.18	---	---
Nevada	23	01	03	5.1	1.82	6.77	12.69	10.93	7.68	8.57	5.14	2.06	.00	56.27
Nevada	14	16	03	05	1.43	2.12	4.01	6.43	6.14	4.81	2.85	1.08	.41	29.52
Truckee	15	20	02	7.1	3.65	7.91	11.00	11.00	11.07	10.77	7.78	2.59	.83	73.96
Bowman's Dam	13	20	—	02	.58	.91	2.17	4.38	3.23	3.28	1.66	.46	.13	17.27
Bea	15	00	01	69	6.06	8.77	10.03	7.10	7.57	5.61	1.90	.62	51.27	59.11
Grass Valley	16	12	02	00	2.90	5.81	9.83	9.37	7.81	7.58	5.75	2.91	.67	52.53
North Bloomfield	7	00	00	32	7.3	1.83	2.67	2.50	1.43	2.18	2.57	.85	.32	15.10
West Butte	13	00	01	19	1.92	4.21	2.53	4.86	3.31	3.68	1.16	.52	.29	21.81
Kono Tyee	7	00	00	49	1.43	4.91	10.11	7.78	3.44	4.79	6.97	1.23	.37	41.85
Middletown	17	02	00	33	2.51	3.71	7.49	11.12	8.75	9.25	5.51	2.53	.72	51.41
Emigrant Gap	14	13	00	32	2.52	4.21	8.66	11.66	10.56	9.98	5.78	2.71	.89	57.55
Glisco	13	09	01	23	2.56	3.12	7.81	8.71	9.36	7.74	1.86	1.83	.00	47.36
Summit	16	00	---	32	1.83	5.51	7.76	8.65	6.10	7.04	5.37	1.03	.56	45.16
Coffax	16	03	01	32	1.57	4.02	6.00	6.39	1.78	1.67	3.37	1.32	.31	33.15
Auburn	11	---	00	36	2.25	4.81	5.98	9.08	7.76	7.71	3.77	1.48	.47	43.76
Alta	16	01	01	88	2.18	3.68	1.25	2.71	2.61	2.01	.70	.23	.23	19.15
Rocklin	14	06	---	49	3.47	6.50	10.39	11.53	8.00	9.23	7.25	2.30	.82	60.01
Georgetown	11	01	01	57	2.90	5.91	7.26	9.10	4.38	6.34	6.18	1.77	.75	45.24
Placerville	20	21	00	24	4.16	7.52	7.72	3.71	5.11	3.49	1.43	.19	31.25	42.08
Slingshot Springs	15	01	00	20	8.9	1.86	3.10	3.55	2.21	2.17	.70	.30	16.18	29.50
Dunsmuir	45	01	00	10	.96	2.00	3.06	3.01	2.07	2.18	.61	.31	16.77	22.81
Woodland	35	00	01	20	.77	1.69	3.80	3.37	2.01	1.89	1.72	.42	.15	15.95
Knights Landing	15	01	---	12	3.95	5.31	7.10	4.41	4.48	3.47	.85	.33	31.83	41.72
Davisville	14	00	00	53	.77	2.32	3.72	5.70	3.12	3.10	2.97	.82	.30	23.36
Calistoga	10	01	00	25	1.93	2.68	4.90	4.39	3.38	2.62	2.15	.57	.31	22.32
Napa	15	02	---	26	1.99	2.63	4.57	4.18	3.28	3.03	2.58	.86	.26	23.69
Petaluma	35	01	---	12	.70	2.16	4.06	3.81	2.81	2.91	1.63	1.03	.12	20.32
Jone	33	00	00	15	.67	1.71	2.16	3.03	2.52	2.66	.62	.23	.14	22.97
Jackson	49	00	00	11	.78	1.41	2.51	2.96	2.12	2.50	.98	.83	.20	19.35
Folsom	15	02	---	26	1.99	2.63	4.57	4.18	3.28	3.03	2.58	.86	.26	23.69
Sacramento	35	01	---	12	.70	2.16	4.06	3.81	2.81	2.91	1.63	1.03	.12	20.32
Sacramento	33	00	00	15	.67	1.71	2.16	3.03	2.52	2.66	.62	.23	.14	22.97
Brighton	49	00	00	11	.78	1.41	2.51	2.96	2.12	2.50	.98	.83	.20	19.35
Galt	15	06	---	18	.91	2.41	4.87	4.13	2.53	2.42	1.71	.56	.26	20.10
Vacaville	41	00	---	15	.35	2.59	2.58	4.33	2.58	2.53	1.57	.56	.26	20.10
Field and Sulsum	10	13	01	15	.35	2.59	2.58	4.33	2.58	2.53	1.57	.56	.26	20.10
Denyerton	10	13	01	15	.35	2.59	2.58	4.33	2.58	2.53	1.57	.56	.26	20.10
Rio Vista	7	00	01	20	2.07	3.16	3.08	3.08	1.54	2.78	.234	.21	16.91	23.77

TABLE SHOWING MONTHLY RAINFALL AVERAGES—Continued.

STATIONS.	County.	Elevation.	Number of Years.	July	August	September	October	November	December	January	February	March	April	May	June	Average — Season	Total— 1885-6.
South Vallejo	Solano	23	14	.00	.00	.08	.72	1.63	2.76	2.65	1.81	2.04	1.89	.51	20	14.32	26.16
Bird's Landing	Solano	64	30	.01	.01	.05	.84	3.72	1.36	2.68	1.78	3.49	1.21	.00	.00	14.84	18.38
Benicia	Solano	50	18	.01	.01	.06	1.07	2.73	4.32	4.70	2.08	2.81	2.36	.49	.21	21.85	31.76
Angel Island	Marin	296	5	.00	.00	.26	1.65	4.21	5.13	3.91	2.18	3.90	3.71	1.06	.60	26.21	32.33
Sausalito	Marin	124	11	.00	.00	.08	.54	2.35	2.77	3.27	2.75	2.98	2.05	.62	.62	26.93	16.48
Point Reyes	Marin	25	11	.03	.00	.25	1.70	3.15	3.73	5.04	3.83	3.89	2.94	.97	.39	25.93	20.55
Point Bonita	Marin	25	11	.00	.00	.34	2.30	4.68	7.03	8.69	8.93	5.45	3.94	1.19	.40	38.98	41.45
San Rafael	Contra Costa	9	9	.00	.00	.11	.60	1.87	3.15	2.88	2.27	2.92	2.49	.56	.25	17.10	23.03
Martinez	Contra Costa	25	8	.00	.00	.01	.53	1.33	2.21	2.20	1.23	1.84	1.52	.47	.18	11.70	13.25
Antioch	Contra Costa	80	9	.00	.00	.01	.51	1.30	2.11	2.27	1.05	1.76	1.69	.31	.27	11.26	16.76
Byron	Contra Costa	63	7	.00	.00	.04	.51	1.63	2.43	2.32	1.19	2.07	2.10	.37	.22	12.84	16.85
East Brother Lighthouse	Contra Costa	33	11	.00	.00	.04	.30	1.45	1.01	1.71	.90	.86	.74	.26	.11	7.47	11.12
Oakland (R. R.)	Alameda	25	9	.01	.03	.25	.98	2.33	2.93	4.19	3.20	3.19	2.73	.81	.33	20.96	26.75
Oakland (Dr. Trembley)	Alameda	25	13	.02	.02	.24	1.43	3.18	4.13	5.10	3.09	3.62	2.48	.74	.49	24.54	32.21
Niles	Alameda	87	16	.00	.00	.11	.83	2.27	3.36	3.20	2.62	2.25	1.70	.55	.25	17.14	23.93
Livermore	Alameda	485	16	.00	.01	.08	.55	1.57	2.78	2.68	2.21	2.00	1.43	.38	.18	13.87	16.53
Pleasanton	Alameda	360	9	.01	.05	.27	.77	1.59	2.85	3.31	2.70	3.24	2.50	.64	.25	17.92	18.90
Calaveras Valley	Alameda	626	4	.00	.00	.26	1.42	1.68	2.35	3.79	4.28	5.47	5.33	1.85	.40	26.83	---
Stockton	San Joaquin	20	16	.01	.00	.06	.58	1.28	2.94	2.54	2.00	1.94	1.44	.64	.11	13.54	---
Farmington	San Joaquin	111	10	.00	.00	.15	.77	1.43	2.94	2.74	2.32	2.40	2.50	.63	.21	15.57	20.00
Lathrop	San Joaquin	25	9	.00	.00	.10	.44	1.32	1.79	2.18	1.77	1.70	1.89	.63	.16	11.98	14.53
Tracy (Hillis)	San Joaquin	76	16	.01	.01	.01	.32	1.14	1.99	1.74	1.34	1.29	.84	.26	.16	9.10	12.30
La Grange	Stanislaus	250	19	.00	.00	.16	.85	2.05	2.80	2.86	2.83	2.40	1.87	.65	.07	16.54	24.09
Langworth	Stanislaus	153	4	.00	.00	.16	.78	2.30	2.55	2.38	1.16	2.98	2.84	.16	.23	15.54	22.55
Modesto	Stanislaus	90	16	.01	.01	.11	.53	1.46	1.67	1.76	1.15	1.24	1.13	.35	.11	9.52	12.85
Grayson	Stanislaus	55	14	.00	.00	.01	.47	1.22	2.70	2.21	1.77	1.65	1.22	.44	.17	11.84	---
Turlock	Stanislaus	106	8	.00	.00	.04	.57	1.73	1.37	1.35	1.25	1.35	1.85	.46	.26	10.26	15.00
Hill's Ferry	Stanislaus	72	6	.00	.00	.13	.35	1.78	1.89	1.70	1.41	2.03	1.55	.70	.27	11.81	16.53
Alcatraz Island	San Francisco	50	21	.00	.01	.01	.61	1.96	3.74	4.01	2.80	2.00	1.42	.40	.18	17.27	27.27
Fort Mason (Black Point)	San Francisco	80	13	.00	.00	.17	1.03	2.74	2.50	3.28	1.90	2.01	2.02	.66	.08	16.42	28.36
Yerba Buena	San Francisco	97	8	.00	.00	.27	.92	2.12	3.49	2.71	1.91	2.62	2.58	.55	.34	17.51	20.12
Presidio of San Francisco	San Francisco	58	32	.12	.00	.09	.71	2.22	4.33	3.96	3.11	2.63	1.85	.51	.30	19.73	27.48
Fort Point	San Francisco	27	15	.01	.00	.05	.56	1.67	4.37	4.07	2.46	1.90	1.20	.56	.02	17.36	---
San Francisco	San Francisco	60	37	.01	.02	.17	.88	3.04	5.34	5.18	3.61	3.18	2.04	.63	.15	24.25	33.05
Fallons	San Francisco	331	6	.00	.18	1.05	1.05	2.52	3.54	2.97	2.10	2.35	2.23	.74	.60	18.18	26.15
San Mateo	San Mateo	30	13	.00	.00	.11	1.01	2.24	3.11	4.24	2.47	2.80	2.23	.50	.32	19.03	22.85

Menlo Park	San Mateo	72	9	00	00	01	03	66	148	249	274	154	241	225	51	38	1510	1831
Woodside	San Mateo	3	8	00	02	16	127	590	947	571	274	478	455	41	45	3313	3740	
Point Montara	San Mateo	3	00	00	29	110	130	329	479	387	241	380	337	102	33	2339	2841	
Pigeon Point	San Mateo	150	8	01	00	18	80	179	317	239	193	212	331	101	26	1697	1835	
Crystal Springs	San Mateo	220	9	03	00	23	195	319	529	777	654	714	407	136	51	3804		
Año Nuevo	San Mateo		8	00	00	25	106	232	519	306	240	313	341	391	40	2221	2336	
Sanita Cruz	Sanita Cruz	25	9	01	01	41	135	240	439	509	375	356	364	67	10	2588	3275	
Aptos	Sanita Cruz		2	06	00	07	78	532	758	524	50	226	456	20	60	2640	3185	
Watsonville	Sanita Cruz	45	4	00	00	10	117	175	743	485	474	211	176	59	60	2153		
Sanita Clara	Sanita Clara	80	7	00	01	03	59	162	253	203	170	227	130	52	39	1363		
San José	Sanita Clara	91	13	00	00	05	68	141	257	263	185	223	105	37	21	1295	2043	
Mt. Hamilton	Sanita Clara	4250		00	01	25	303	187	457	368	605	154	234	131	60	3374		
Tennant	Sanita Clara	335	7	00	00	08	55	83	323	323	402	436	307	93	23	2096		
Gilroy	Sanita Clara	261	13	—	01	20	192	228	316	462	302	291	205	43	16	1986	2131	
Merced	Merced	171	11	01	00	09	43	131	173	236	131	151	152	46	21	1109	1143	
Los Baños	Merced		11	02	—	04	43	146	74	161	108	120	77	28	13	754	1308	
Central Point	Merced	117	7	00	00	08	32	135	161	152	165	185	129	48	20	925	1547	
Borden	Presno	274	12	02	00	—	31	126	131	157	148	142	133	37	17	927	1827	
Presno	Presno	295	9	00	00	09	40	126	138	141	111	133	133	89	14	937	1622	
Firebaugh Ferry	Presno	150	14	00	00	07	31	151	128	178	114	112	91	16	17	848	1884	
Lemoore	Presno	227	8	—	00	03	33	145	211	187	165	120	142	16	20	982	1731	
New Idria	Presno		4	01	00	08	55	209	321	218	243	556	354	76	85	2126	2736	
Kingsburgh	Presno	301	8	00	00	04	36	113	137	121	121	134	139	39	12	936	135	
Fort Miller	Presno	402	8	00	00	03	28	263	540	195	176	429	191	165	00	1900		
Bishop Creek	Inyo		3	00	00	00	01	00	46	00	54	49	00	00	00	131	462	
Keeler	Inyo	3622	3	00	16	00	12	33	53	24	42	51	47	53	27	358	290	
Independence	Inyo	3957	13	10	18	07	32	21	227	122	56	52	21	27	01	537		
Hollister	San Benito	292	13	02	01	08	66	156	170	258	172	184	124	34	20	1194	1487	
Salinas	Monterey	75	12	01	01	08	75	133	182	348	247	249	155	41	25	1375	2032	
Chualar	Monterey	111	9	01	00	04	91	164	182	278	241	247	148	40	20	1149	1627	
Monterey	Monterey		42	12	04	01	62	152	271	210	188	331	204	45	23	1196	1912	
Soledad	Monterey	188	13	00	01	01	30	168	143	246	145	167	78	26	13	894	1470	
Pajaro	Monterey	31	13	01	01	12	116	213	308	433	268	282	184	30	21	1889	2718	
Gonzales	Monterey		10	00	00	03	47	104	166	173	178	170	116	20	16	1003	1524	
Goshen	Tulare	286	9	00	00	07	32	89	133	167	125	116	123	45	09	776	1042	
Visalia	Tulare	335	8	00	00	01	50	162	186	134	145	123	164	30	01	939	1310	
Hanford	Tulare		7	—	01	01	145	59	338	130	162	191	162	27	21	1223		
Tulare	Tulare	280	13	01	00	02	21	56	109	141	117	100	108	24	10	689	925	
San Luis Obispo	San Luis Obispo	270	17	—	00	03	72	195	433	468	375	281	205	35	11	2131		
Delano	Kern	319	11	00	00	01	18	78	383	78	109	493	114	38	02	634	844	
Sumner	Kern	422	12	—	00	00	40	56	82	94	67	49	86	30	11	502	594	
Caliente	Kern	1290	11	—	00	02	49	82	107	136	191	177	198	84	12	1098	1283	
Keene	Kern	2705	10	01	—	06	68	85	209	172	287	203	220	35	22	1328	1231	
Tehachapi	Kern	3964	10	01	11	01	37	66	167	149	257	182	156	40	14	1104	1523	
Mojave	Kern	2751	8	07	01	03	03	40	129	80	132	56	46	02	—	494	458	

TABLE SHOWING MONTHLY RAINFALL AVERAGES—Continued.

STATIONS.	County.	Elevation.	Number of Years.	July	August	September	October	November	December	January	February	March	April	May	June	Average Season.	Total— 1885-6.
Fort Tejon	Kern	3,246	10	.02	.16	2.02	1.00	1.49	4.32	1.62	3.19	2.49	3.19	1.17	.21	20.88	9.06
Colton	San Bernardino	965	10	.05	.03	.00	.24	.47	1.54	1.46	2.23	1.57	1.52	.63	.09	9.84	20.25
San Bernardino	San Bernardino		16	.02	.08	.05	.43	1.58	3.10	3.66	3.03	1.97	1.75	.44	.06	16.17	9.00
Riverside	San Bernardino	1,030	5	.00	.60	.02	.27	.37	3.18	1.97	1.93	1.93	1.16	.43	.02	9.37	9.00
Camp Cady	San Bernardino	3,000	3	.35	.63	.00	.30	.27	.46	.18	.50	.37	.28	.08	.00	3.60	
Ravenna	Los Angeles	2,358	7	.00	.08	.05	.33	1.19	2.16	1.93	2.01	2.41	1.20	.69	.27	11.72	18.79
Newhall	Los Angeles	1,268	10	.00	.00	.00	.32	1.51	2.89	2.30	2.67	2.49	1.80	.52	.17	14.63	24.57
San Fernando	Los Angeles	1,066	9	.00	.00	.00	.32	1.48	2.64	2.51	2.61	2.61	1.91	.43	.22	15.02	22.56
Alosta	Los Angeles	600	6	.00	.00	.00	1.01	1.75	2.97	4.03	6.19	5.17	3.10	.78	.42	25.45	28.95
Cahuenga Valley	Los Angeles	300	4	.00	.00	.03	.58	2.91	2.51	3.30	3.92	3.60	2.18	.97	.20	20.20	23.63
Los Angeles (Signal Service)	Los Angeles	371	9	.00	.00	.01	.56	1.47	3.67	2.70	3.50	2.95	2.15	.45	.18	17.64	22.70
Anaheim	Los Angeles	250	9	.00	.00	.00	.36	.86	2.02	1.73	2.39	1.92	1.12	.47	.14	11.01	14.75
Santa Monica	Los Angeles	50	3	.00	.00	.00	.12	8.92	1.52	4.22	.61	.50	1.37	.07	.01	16.13	24.68
Spadra	Los Angeles	705	12	.00	.01	.01	.42	1.20	1.78	3.15	2.29	1.92	1.32	.32	.06	12.39	16.50
South Side (Ravenna)	Los Angeles	2,358	7	.00	.08	.05	.33	1.19	2.16	1.93	2.01	2.41	1.20	.69	.27	11.72	18.79
Drum Barracks	Los Angeles	32	5	.06	.20	.00	.03	.32	2.18	2.22	1.17	1.92	.31	.00	.00	8.74	
Nordhoff	Ventura	1,200	5	.00	.00	.00	.36	.467	2.51	4.39	4.32	5.32	3.80	1.24	.48	27.72	39.49
San Buenaventura	Ventura	50	11	.00	.00	.01	.44	1.93	2.53	3.86	3.57	2.37	1.48	.38	.27	16.87	21.12
Santa Maria	Santa Barbara		2	.00	.00	.00	.00	8.78	3.10	1.21	.97	1.34	2.26	.00	.00	17.06	19.15
Point Conception	Santa Barbara	258	8	.00	.00	.00	.37	.44	1.87	1.81	3.81	2.73	1.48	.11	.16	12.21	7.62
Santa Barbara	Santa Barbara	30	19	.01	.00	.01	.47	1.57	3.88	3.92	3.79	1.99	1.73	.33	.13	17.83	23.74
Guadalupe	Santa Barbara	333	1	.00	.00	.00	.00	8.83	3.39	2.89	.00	2.60	3.65	.00	.00	21.56	21.56
Indio	San Diego	12	9	.00	.00	.00	.01	.26	.58	.33	.51	.11	.05	.03	.00	2.32	.90
Full Brook	San Diego	700	11	.02	.05	.05	.70	1.36	2.65	3.51	3.56	2.97	2.21	.53	.11	17.75	26.23
Poway	San Diego		8	.01	.03	.01	.63	.87	2.51	2.65	2.38	2.27	2.18	.56	.10	14.15	16.80
Escondido	San Diego		11	.00	.02	.25	.48	1.39	1.92	3.27	3.23	2.51	1.81	.53	.22	15.69	20.87
San Diego	San Diego	40	15	.02	.29	.05	.47	.67	2.28	2.05	2.36	1.50	.94	.40	.07	11.01	16.95
Julian	San Diego		5	.00	.00	.35	.55	2.28	4.81	8.25	9.85	5.90	.73	.00	.00	37.74	
Mammoth Tank	San Diego	265	9	.10	.30	.00	.17	.18	.52	.39	.32	.10	.11	.02	.00	2.21	2.70
Fort Yuma	San Diego	200	17	.42	.88	.83	.13	.40	.29	.21	.43	.21	.06	.00	.00	3.86	
Oregon.																	
Astoria	Clatsop	52	23	1.20	1.48	3.59	5.27	10.18	12.44	12.21	9.18	9.68	4.90	3.48	2.87	76.48	66.89
Fort Stevens	Clatsop		6	2.03	2.02	2.39	4.68	11.14	12.67	11.48	10.66	9.32	5.41	2.94	3.83	78.57	
Portland	Multnomah	88	15	.82	.72	1.87	4.65	7.15	8.17	7.02	7.37	6.23	3.32	2.44	1.71	51.47	41.92
Fort Yamhill	Yamhill		9	.36	.42	2.69	2.96	7.55	10.08	9.51	7.31	7.66	3.03	2.41	1.61	55.59	
Oregon City	Clackamas	200	3	.15	.91	2.24	3.46	5.12	8.75	7.98	5.17	7.15	1.92	3.37	1.41	47.61	



## METEOROLOGICAL DATA.

A Brief Review on the Meteorological Condition of Sacramento, California, for Each Month, from January, 1885, to August, 1886, Inclusive.

The following meteorological data was compiled by Sergeant James A. Barwick, Observer Signal Corps, U. S. Army, in charge of the United States Signal Office in this city, for the biennial report of the State Board of Health of California:

January, 1885—Mean temperature, normal; rainfall, 2.16 inches, which is 1.61 inches less than the average precipitation for 35 years; frost was deposited on six days; highest water in the river, 23.5 feet; lowest, 17 feet; earthquake shock on the thirtieth. Highest temperature, 62°; lowest, 34°.

February—Mean temperature, 4° higher than the average for 33 years; rainfall, .49 of an inch, being 2.44 inches below the average for many years; killing frost twice, and light frost four times; highest river, 18 feet; lowest, 16.1 feet. Highest temperature, 70°; lowest, 40°.

March—The mean temperature was about 4° warmer than the average for 33 years. This was the driest month of March known here since 1849. The rainfall was but .08 of an inch, while the average of many years was 3 inches; highest river, 16 feet; lowest, 13.9 feet; partial eclipse of the sun on the sixteenth. Highest temperature, 77°; lowest, 46°.

April—The mean temperature was 1.4° above the average for many years; rainfall, .68 of an inch, which was 1.23 inches less than the average for 35 years; two earthquake shocks—one on the third and one on the eleventh; frost on four occasions; highest river, 15.2 feet; lowest, 13.5 feet; last frost of Spring, April twentieth. Highest temperature, 83°; lowest, 39°.

May—The mean temperature was 1.5° above the average for 33 years; rainfall, only a sprinkle, which was .74 of an inch below the average precipitation for many years; highest river, 13.9 feet; lowest, 11 feet. Highest temperature, 98°; lowest, 50°.

June—The mean temperature was 4.2° below the average for many years; rainfall, very near the average, the latter being .13 of an inch, while the rainfall for this month was .11 of an inch; solar halo on the twenty-fourth; highest river, 11 feet; lowest, 9 feet. Highest temperature, 91°; lowest, 51°.

July—This was the windiest month on record, giving from 816 to 2,149 miles more wind than is usual for this month; mean temperature, 2.2° below the average for 33 years; average rainfall for many years, .03 of an inch; this month gave only a sprinkle; two solar halos, and two parheliads, or sun dogs, on the ninth; highest river, 9 feet; lowest, 7.8 feet. Highest temperature, 98°; lowest, 56°.

August—The mean temperature was 1.4° above the average for 33 years; the highest temperature recorded occurred this month, and was 105°; rainfall, none, the average of many years being a sprinkle; the highest river, 7.8 feet; lowest, 7.3 feet. Highest temperature, 105°; lowest, 52°.

September—The mean temperature was  $1.2^{\circ}$  warmer than the average for 33 years; the average rainfall for many years was .11 of an inch; this month gave .08 of an inch, or a very small amount below the mean; lightning on the fifth and sixth; highest river, 7.10 feet; lowest, 7.3 feet; solar halo on the eighth. Highest temperature,  $98^{\circ}$ ; lowest,  $50^{\circ}$ .

October—The mean temperature was  $1.9^{\circ}$  warmer than the average for 33 years; the average rainfall for many years was .72 of an inch, while this month only gave .02 of an inch, which is .70 of an inch below the average for many years; sheet and forked lightning on the sixth; solar halo on the twelfth; coronæ around the moon on the twenty-third; highest river, 7.7 feet; lowest, 7.5 feet. Highest temperature,  $98^{\circ}$ ; lowest,  $40^{\circ}$ .

November—The mean temperature was  $1.1^{\circ}$  greater than the average for 33 years past; there were 2,705 miles more wind than usually sweeps over this station during November; this month was warmer, and gave more wind and a higher velocity, more rain, and more cloudy and rainy days than are usual for the third month of the rainy season. There were 9.44 inches more rain than the average for 36 years; rainfall for the month, 11.34 inches—the average for many years being only 1.90 inches; there were three frosts; highest river, 21.2 feet; lowest, 7.5 feet; first frost of Autumn, November twelfth. Highest temperature,  $77^{\circ}$ ; lowest,  $38^{\circ}$ .

December—The mean temperature was  $2.1^{\circ}$  warmer than the average of the 33 years; the rainfall was 5.76 inches, which is 1.11 inches more than the average precipitation of 36 years. There was a lunar halo on the twenty-fourth, and five light frosts; highest river, 23.9 feet; lowest, 17.2 feet. Highest temperature,  $65^{\circ}$ ; lowest,  $38^{\circ}$ .

We find by the above annual review that the mean temperature for each month was above the average of many years, except June and July; these months were below the average.

The mean temperature for the year 1885, is  $61.2^{\circ}$ , while the average for 34 years is  $60.2^{\circ}$ , showing the year 1885 to have been a warmer one than usual. The rainfall from January to June was the least ever known to have been precipitated, and the rainfall from September to December thirty-first was the most ever precipitated, except in 1852, when 19.41 inches were measured against 17.21 inches for 1885. Highest temperature for the year 1885, was  $105^{\circ}$  in July; the lowest,  $34^{\circ}$  in January.

January, 1886—The mean temperature for January was  $1.3^{\circ}$  below the average of many years; the rainfall was 7.95 inches, which is 4.18 inches in excess of the average precipitation during the last 30 years. There were killing frosts on nine days; and lightning in the northeast on the twentieth, after the heaviest wind storm that has ever visited Sacramento. Lightning, in January, is an unheard of thing for this vicinity.

The maximum velocity of wind was over forty-four miles per hour on the twentieth, and on one occasion during the day five miles was made in five minutes, which is at the rate of sixty miles per hour.

The highest river was 25.6 feet on the twenty-eighth; the lowest river was 17.1 feet on the eighteenth. This was the highest water in the river since February 4, 1881, when it reached 26.6 feet. First killing frost of this season was on January second. Highest temperature,  $62^{\circ}$ ; lowest,  $28^{\circ}$ .

February, 1886—The mean temperature for February was  $53.3^{\circ}$ , which was  $2.3^{\circ}$  warmer than the average for many years. Average rainfall, 2.866 inches, showing February to have been 2.576 inches below the average of many years. A brilliant meteor passed to the west in the north on the thirteenth; a hailstorm on the twenty-eighth. Highest water in the river, 25 feet on the first; and the lowest, 14.8 feet on the twenty-eighth.

Peach trees and other fruits in bloom as early as the fifteenth. Highest temperature, 73°; lowest, 38°.

March, 1886—The mean temperature was 3° cooler than the average of many years. The average for the month was 52.1°, and for 33 years was 55.1°. Average rainfall, 2.91 inches for 36 years; the rainfall for March was 2.68, or nearly normal. Highest water in the river, 19.5 feet on the sixth; lowest, 17.5 feet on the thirty-first. Highest temperature, 72°; lowest, 38°.

April, 1886—The mean temperature was 55.5°, being 3.8° below the average temperature for April during the past 33 years. The average rainfall during April for 36 years was 1.87 inches, while April, 1886, gave 4.08 inches, or an excess of 2.21 inches over the average precipitation of many years. The highest river was 23.8 feet on the twenty-third; the lowest, 17.5 feet on the first. Last frost of the season April fourth. Highest temperature, 80°; lowest, 39°.

May, 1886—The mean temperature was 62°; being 2° cooler than the average monthly mean temperature for many years. May, 1860, gave the lowest monthly average; being 59.8°, which was 2.2° cooler than May, 1886. The highest average monthly mean was in 1865, 70°; which was 8° above the average of May, 1886. The rainfall was but .07 of an inch, while the average precipitation of many years was .71 of an inch, showing this month to have been below the average amount of rainfall. Highest water in the river, 23 feet on the first; lowest water in the river, 21 feet on the thirtieth and thirty-first. Highest temperature, 94°; lowest, 44°.

June, 1886—The average June temperature for 33 years past was 70.3°, while the average temperature June, 1886, was 69°, or 1.3° below the average of many years. The average rainfall for 36 years past was .13 of an inch, while June, 1886, gave no rainfall. The greatest rainfall for June was 1.45 inches in 1884. Highest water in the river, 20.8 feet on the first and second; lowest water in the river, 13.9 feet on the thirtieth. Highest temperature, 98°; lowest, 52°.

July, 1886—The mean average monthly temperature for July during the past 33 years was 73.2°. The mean for July, 1886, was 72°, which is 1.2° below the average for many years. The average rainfall for the past 37 years was .03 of an inch. There was no rainfall during July, 1886. The greatest amount ever recorded in July was .63 of an inch in 1860 and .55 of an inch in 1861. The highest water in the river was 13.7 feet on the first; the lowest water in the river was 10 feet, on the thirty-first. Highest temperature, 105°; lowest, 52°.

August, 1886—The mean average temperature for August for the past 33 years was 71.7°, and the mean temperature for August, 1886, was 71.6°, being a normal temperature. The average precipitation of rain in August for 37 years past was .003 of an inch, while August, 1886, there was none. The heaviest rainfall was but .08 of an inch in 1864. The highest river was 10 feet on the first, and the lowest, 8.2 feet, from the twenty-seventh to the thirty-first, inclusive. Highest temperature, 102°; lowest, 53°.

Gales of 25 miles per hour and over for each month during 1885, and for January, February, March, April, May, June, July, and August, 1886, will be found as follows:



January, 1885	None.	January 21, 1886	S. 28 miles.
February 12, 1885	N.W. 25 miles.	January 22, 1886	S.E. 28 miles.
February 23, 1885	N.W. 31 miles.	January 23, 1886	S.E. 30 miles.
March, 1885	None.	February 15, 1886	N.W. 32 miles.
April, 1885	None.	February 26, 1886	S.W. 26 miles.
May 12, 1885	S. 25 miles.	March 10, 1886	N.W. 28 miles.
May 22, 1885	N.W. 30 miles.	March 11, 1886	N.W. 26 miles.
June, 1885	None.	March 14, 1886	N.W. 37 miles.
July 2, 1885	S. 25 miles.	March 24, 1886	N.W. 30 miles.
August, 1885	None.	March 25, 1886	N.W. 27 miles.
September, 1885	None.	March 26, 1886	N.W. 30 miles.
October, 1885	None.	March 27, 1886	N.W. 30 miles.
November 16, 1885	S.E. 27 miles.	April 6, 1886	S. 28 miles.
November 17, 1885	S.E. 36 miles.	April 19, 1886	N.W. 36 miles.
November 22, 1885	S.E. 32 miles.	May 1, 1886	N.W. 27 miles.
November 24, 1885	S.E. 32 miles.	June 12, 1886	N.W. 42 miles.
December 7, 1885	N.W. 25 miles.	July, 1886	None.
January 1, 1886	N.W. 38 miles.	August, 1886	None.
January 20, 1886	S.E. 44 miles.		

The following table gives the total number of clear, fair, and cloudy days, and the number of days on which rain was precipitated for each year from 1878 to 1885, inclusive, and for January, February, March, April, May, June, July, and August, 1886:

YEAR OF—	Clear Days.	Fair Days.	Cloudy Days.	Days on which Rain Fell.
1878	225	81	59	67
1879	223	96	46	69
1880	244	62	60	58
1881	233	68	64	69
1882	251	71	43	62
1883	262	77	26	46
1884	239	69	58	69
1885	228	88	49	57
Totals	1,905	612	405	497
Averages	238.1	76.5	50.6	62.1
Total number of clear, fair, cloudy, and rainy days up to September 1, 1886.	172	53	18	48

#### AVERAGE ANNUAL AND SEASONAL TEMPERATURES.

The statement below shows the average temperature, for each year, for 33 years: the Spring, for thirty-four years; Summer and Autumn, for 33 years, and the average Winter temperature for 32 years. The coldest year, inferring from the average temperature, was that of 1880—57.5°; the warmest was 1864—62.8°; the mean average for the past 33 years being 60.2°, showing the coldest to have been 2.7° below the mean average, while the warmest year being that of 1864, when it was 2.6° above the mean average for 33 years. By careful study of the following table, one is struck by the slight difference between the coldest and warmest year, as compared with a 33 years' average, generally not more than 3°. That is, we might safely say that the average temperature of any year is not likely to vary more than 3° from 60°, either way, between the hottest and coldest year, as compared with the mean average temperature for the past 33 years:

YEAR.	Mean Annual Temperature.	Mean Spring Temperature.	Mean Summer Temperature.	Mean Autumn Temperature.	Mean Winter Temperature.
1853	62.6	62.9	74.3	69.0	47.3
1854	59.5	58.3	72.4	60.0	48.0
1855	59.5	57.7	72.2	60.5	48.9
1856	60.1	59.9	71.9	60.4	47.5
1857	60.7	61.7	71.5	60.9	48.2
1858	59.5	59.6	70.3	60.9	46.6
1859	58.7	57.2	70.4	61.1	46.5
1860	59.0	56.5	70.8	60.3	49.5
1861	60.1	59.8	69.8	60.4	48.3
1862	62.2	57.6	72.5	63.7	47.1
1863	60.3	61.4	71.8	61.5	49.8
1864	62.8	62.2	73.5	62.6	48.9
1865	61.0	61.0	73.1	62.9	51.4
1866	62.1	59.7	74.8	63.7	48.7
1867	59.9	58.3	71.9	62.1	48.1
1868	60.1	59.8	71.5	61.4	48.2
1869	60.4	58.9	72.1	62.3	47.7
1870	59.6	57.0	71.2	61.7	50.2
1871	59.6	58.9	70.8	59.9	50.0
1872	60.4	60.5	71.6	59.6	47.6
1873	60.7	61.6	70.4	62.9	48.2
1874	59.8	59.0	71.3	62.1	49.0
1875	62.5	63.3	72.1	60.8	49.9
1876	61.7	59.9	74.6	62.3	49.9
1877	61.2	61.2	73.5	63.4	49.2
1878	61.3	60.5	72.9	62.5	44.5
1879	60.3	59.3	72.9	60.9	51.0
1880	57.5	55.0	69.1	59.9	45.9
1881	59.2	60.4	68.5	58.5	45.4
1882	58.5	57.6	71.1	58.8	45.9
1883	58.8	58.5	72.4	60.1	50.0
1884	58.8	57.9	69.8	60.0	49.4
1885	61.2	61.8	70.1	62.8	
1886		56.5	70.9		
Totals	1,987.6	2,021.4	2,436.6	2,029.9	1,595.5
Averages	60.2	59.5	71.7	61.5	48.3

HIGHEST AND LOWEST TEMPERATURE AT SACRAMENTO, FROM 1878, TO AUGUST 31, 1886, INCLUSIVE.

YEAR.	Highest Temperature.	Lowest Temperature.
1878	100°, August	24°, December.
1879	103°, August	25°, December.
1880	98°, July	25°, January.
1881	99°, July	32°, December.
1882	100°, August	27°, December.
1883	103°, July	22°, January and February.
1884	100°, August	21°, February.
1885	105°, August	34°, January.
1886, up to September 1	105°, July	28°, January.

The following table of rainfall at Sacramento, from September, 1849, to August 31, 1886, was collated from the records of Dr. T. M. Logan, Dr. F. W. Hatch, and those of the United States Signal Service:

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Inches.
1849	4.50	.50	10.00	4.25	.20	none	none	none	.25	1.50	2.25	12.50	13.50	1849-50	36.00
1850	.65	.35	1.88	1.14	none	none	none	none	none	none	spring	spring	13.50	1850-51	4.71
1851	.58	.12	6.40	.19	.30	none	none	none	1.00	.18	2.14	7.97	7.97	1851-52	17.31
1852	3.00	2.00	7.00	3.50	1.45	spring	spring	none	spring	spring	6.00	13.41	27.99	1852-53	36.35
1853	3.25	8.50	3.25	1.50	.21	.31	none	spring	spring	1.01	.65	1.15	19.83	1853-54	20.05
1854	2.76	4.46	4.20	4.32	1.15	.01	none	none	spring	none	.75	2.00	18.35	1854-55	18.62
1855	4.92	3.69	1.40	2.13	1.84	.03	none	none	spring	none	.55	2.40	11.26	1855-56	13.76
1856	1.38	4.80	.68	spring	spring	.35	none	spring	none	.66	2.41	2.63	12.91	1856-57	10.46
1857	2.44	2.46	2.88	1.21	.20	.10	none	spring	spring	3.01	.15	4.34	16.80	1857-58	14.04
1858	.96	3.91	1.64	.98	1.04	none	none	none	.02	none	6.48	1.83	16.86	1858-59	16.01
1859	2.31	.93	5.11	2.87	2.49	.02	.63	none	.96	.91	.18	4.28	19.19	1859-60	22.06
1860	2.67	2.92	3.32	.48	.59	.14	.55	none	none	spring	2.17	8.64	21.38	1860-61	16.18
1861	15.04	4.26	2.80	.82	1.81	.01	none	.01	none	.36	spring	2.33	27.44	1861-62	36.10
1862	1.73	2.75	2.36	1.69	.36	none	none	none	spring	none	1.49	1.82	18.03	1862-63	11.59
1863	1.08	.19	1.30	1.08	.74	.09	none	.08	spring	.12	6.72	7.87	19.27	1863-64	7.79
1864	4.78	.71	.48	1.37	.46	none	spring	none	.08	.48	2.43	.36	11.15	1864-65	22.59
1865	7.70	2.01	2.02	.48	2.25	.10	.02	none	none	spring	2.43	9.51	26.52	1865-66	17.91
1866	3.44	7.10	1.01	1.80	.01	none	none	none	.01	none	3.81	12.85	30.03	1866-67	25.32
1867	6.04	3.15	4.35	2.31	.27	spring	none	none	none	none	.77	2.61	19.50	1867-68	32.79
1868	4.79	3.63	2.94	1.24	.65	.01	none	none	spring	2.12	.85	1.96	18.19	1868-69	16.64
1869	1.37	3.24	1.64	2.12	.27	spring	spring	spring	none	.02	.58	.97	10.21	1869-70	13.57
1870	2.08	1.92	.69	1.45	.76	spring	none	none	spring	.21	1.22	10.99	19.32	1870-71	8.47
1871	4.04	4.74	1.94	.61	.28	.02	none	none	spring	.22	1.93	5.39	18.72	1871-72	24.05
1872	1.23	4.36	.55	.51	none	spring	none	spring	none	.31	1.21	10.01	19.17	1872-73	14.19
1873	5.20	1.86	3.05	.89	.37	spring	spring	none	.05	2.26	3.80	.44	17.92	1873-74	22.92
1874	8.70	.55	.80	spring	spring	1.10	none	none	none	.44	6.20	5.52	17.31	1874-75	17.70
1875	4.99	3.75	4.15	1.10	.15	none	.21	.02	spring	3.45	.30	none	18.12	1875-76	26.31
1876	2.77	1.04	.56	.19	.64	.01	spring	spring	none	.73	1.07	1.43	23.45	1876-77	9.19
1877	9.26	8.04	3.09	1.07	.17	none	none	none	.29	.55	.51	.47	23.45	1877-78	24.86
1878	3.18	3.88	4.88	2.66	1.30	.13	spring	spring	none	.88	2.05	3.41	22.37	1878-79	17.85
1879	1.64	1.64	1.70	14.20	.76	none	spring	spring	none	none	.05	11.81	31.99	1879-80	26.47
1880	6.14	5.06	1.37	1.64	spring	.50	spring	none	.30	.55	1.88	3.27	20.71	1880-81	26.57
1881	1.89	2.40	3.78	1.99	.35	.10	spring	none	.57	2.63	3.22	1.13	18.06	1881-82	16.51
1882	2.23	1.11	3.70	.67	2.85	none	none	none	.90	.97	.61	.44	13.48	1882-83	18.11
1883	3.43	4.46	4.32	4.32	.06	1.45	none	none	.90	2.01	none	10.45	34.92	1883-84	24.78
1884	2.16	.49	.08	.68	spring	.11	spring	spring	.08	.02	11.34	5.76	20.72	1884-85	16.58
1885	7.95	.29	2.68	4.08	.07	none	none	none	none	none	none	none	18.83	1885-86	32.27
Totals.	142.19	103.46	107.82	71.54	25.79	4.59	1.14	.11	4.21	25.80	79.80	172.19	707.07	-----	737.71
Averages.	3.843	2.796	2.913	1.934	.697	.124	.031	.003	.114	.697	2.217	4.054	19.641	-----	19.639

# I. REPORT ON THE TOPOGRAPHY, BOTANY, CLIMATOLOGY, AND DISEASES OF SURPRISE AND GOOSE LAKE VALLEYS.

By GEORGE M. KOBER, M.D., U. S. A., Fort Bidwell; Modoc County correspondent of the Board. Supplemented by extracts from Reports of W. MATTHEWS, M.D., U. S. A., WM. H. PATTERSON, M.D., Cedarville, and JOHN M. FORREST, M.D., Alturas, Modoc County.

In my description of the topography of this section, I shall confine myself to two important valleys of Modoc County, geographically known as Surprise and Goose Lake Valleys.

*Surprise Valley* is situated on the eastern slope of the Warner Mountains, extending almost north and south, about sixty miles in length and from six to eight miles in width. A high divide on the north separates this valley from Warner Valley, Oregon; on the west from Goose Lake Valley; on the south a long cañon connects it with the sagebrush plains of Nevada, and on the east a lower range of mountains separates it from Coleman and Long Valleys in Nevada. It is a monoclinal valley, of moderately inclined beds of a plutonic outflow. The strata dip towards the Sierra Nevadas, westward; the elevation of the valley above the sea level is four thousand six hundred and eighty feet. The Warner Mountains, like the great Sierra Nevadas, of which they are doubtless a portion, have a slate base, and superimposed are strata of quartz. Sandstone also abounds near the surface, and forms the greater portion of the lower range of hills. The average elevation of these mountains is about six thousand feet, although some of the peaks, as Mount Bidwell, attain the respectable height of nearly eight thousand feet above the level of the sea, and remain snow-clad until the middle of July.

Surprise Valley is destitute of timber, but the numerous ravines and cañons traversing the mountains contain fine forests of pine and cedar. The soil is composed of disintegrated basalt, sand, and clay, and is very fertile. Below this soil is found a bed of gravel of variable depth. Most of the wells are sunk through a deposit of gravel, from fifteen to thirty feet in depth, when "hard pan" is reached, which may be a clay bank or a peculiar sandstone formation.

The valley contains three lakes, of about equal size, known as the Upper, Middle, and Lower Lakes, their combined area being about one hundred square miles. These lakes have no outlet, and desiccation has concentrated the salts in all of them. The water is intensely alkaline to the taste. They are shallow for a considerable distance from the shores, and receive their water supply from the numerous streams of the Warner Mountains. The Middle and Lower Lakes have been known to dry up completely during several dry seasons, revealing a deposit of fine alkaline mud, which, when desiccated, looks white; and in the distance the former lake bed presents the appearance of a beautiful sheet of water. The water, doubtless, contains a large percentage of magnesia, sodium, soda, chlorine, sulphuric acid, and carbonate of lime. It is needless to observe that the lakes are

not habitable by fishes, their only animal population being crustacea and the larvæ of insects.

The east side of the valley affords but very few water channels, as the eruptive hills or table lands are rather low, and do not condense much snow and moisture. Owing to this fact, and the comparative absence of erosive action, the eastern half, unlike the western half of the valley, has no rich alluvial deposits, and the soil is strongly impregnated with alkaline salts towards the lake, while the higher portions are composed of a mixture of sand and clay, which supports a more or less luxuriant growth of artemisia (sagebrush).

The town of Fort Bidwell is located about eight miles from the southern boundary of Oregon, and the same distance from Nevada, in latitude  $42^{\circ} 10'$  north, longitude  $43^{\circ} 12'$  west. The site is at least two miles north of the upper lake, on a gravelly slope which gradually ascends towards the foothills. A beautiful mountain stream drains the locality. This stream near its terminus, however, becomes sluggish, and in the course of time has deposited an immense amount of debris, and thus formed a peninsula, which extends for a mile and a half into the lake. The character of this land is essentially a "swamp," covered with *typha latifolia*. Numerous small ponds and sloughs are also observed. With this exception, the lower lands on the north and west side of the lake are natural meadows, and yield an excellent quality of grass. Some families live in these meadows, their wells being only from five to eight feet in depth. The higher lands are well adapted for agriculture, and in some localities require artificial moisture. Numerous fruit trees, consisting of apples, plums, pears, and peaches have been successfully cultivated and yield fine crops in the order named.

The town of Lake City is situated on the foothills, near the southwestern end of the upper lake; Cedarville at the mouth of a beautiful cañon west of the middle lake, and Eagleville near a cañon west of the lower lake. In these and other localities, the mountain streams have washed immense deposits into the lake, and thereby formed deltas of variable extent, according to the erosive power of the streams. Numerous farms are scattered throughout the valley, but more especially along the western half of the valley. The combined population of the valley is about three thousand. The scenery, notwithstanding the shallow shores of the lakes, presents many elements of beauty, combining, as it does, mountain and water scenery with a clear atmosphere and a good sprinkling of verdure. No wonder that the early pioneers of California, in their overland travel across the sagebrush plains of Nevada, upon their emergence through "'49 Canon," were suddenly impressed with its beauty, and named it "Surprise Valley."

*Goose Lake Valley* is located on the western slope of the Warner Mountains, and is about fifty-five miles in length, and twelve miles in width; elevation above the level of the sea, four thousand eight hundred feet. The valley extends nearly north and south, and is bounded on the east by the Warner Mountains, already described; on the west by eruptive hills of no great elevation, which, sixty miles further west, are known as the "lava beds," and former stronghold of the Modoc Indians. To the north, the valley is cut off by the watershed of the Chewaucan, and to the south by that of the Pitt River. It contains a fine sheet of water, known as Goose Lake, which is thirty miles in length, and about ten miles in width. The lake is shallow for a long distance from its northern, southern, and eastern shores, and has no outlet, but a slight elevation would connect it with the watershed of the Pitt River in the south. It receives its water supply from

numerous mountain streams, notably from the Warner Range on the east, which maintain it in a more or less fresh condition. The water is slightly alkaline to the taste, but the lake abounds in fishes and water birds. The lakes of Oregon, Nevada, and California diminish in alkalinity as we approach the Sierra Nevadas. Goose Lake has never been known to dry up, although, during prolonged dry seasons, and, in fact, to a limited extent every Summer and Autumn, the water falls sufficiently to expose a vast tract of land on the southern and northern shores.

The scenery of this valley and lake presents many elements of beauty. The soil and geological formation is similar to that of Surprise Valley, with perhaps a larger admixture of clay. The best soil is found on the eastern half of the valley, or west slope of the Warner Mountains, owing, doubtless, to the erosive action of the elements and mountain torrents on the volcanic rocks which abound in this range. The soil of the west side of the valley is a mixture of clay and sand, impregnated with alkali, and supports a luxuriant growth of sagebrush. Along some of the watercourses on that side the soil is more fertile. The principal settlement is at Davis Creek, on a gradual slope towards the southeastern shores of the lake. Here the action of Davis Creek has formed a peninsula, which extends two and one half to three miles into the lake. This hamlet is about twenty-five miles in a northeastern direction from Alturas, the county seat. Another thrifty settlement, known as Willow Ranch, is located about fourteen miles north of Davis Creek; and still another settlement on New Pine Creek, ten miles north of the latter place, and close to the Oregon boundary line. The various mountain streams, especially those in the localities mentioned, have carried immense deposits into the lake and formed numerous deltas. This new formation is more or less marshy, and portions of it are covered with tules, but the land lying somewhat higher, is good meadow land, and the higher tracts, as in Surprise Valley, are specially adapted for the production of cereals, requiring not infrequently irrigation, especially for garden produce. Numerous settlements are scattered throughout the valley, some occupying the low lands, but most of the settlers have built their premises on the western slope of the Warner Mountains. It will be observed that Surprise Valley is bounded with low mountains on the east and high mountains on the west, while the inverse condition obtains in Goose Lake Valley. In consequence thereof, the latter valley receives a larger precipitation of snow and moisture, and is more exposed to the prevailing winds from the west. The arrangement of the mountains, the consequent water supply and fertility of the soil, also influences the settlement of the two valleys. While in Surprise Valley most of the settlements are in the west half of the valley, the majority of the people in Goose Lake Valley have selected the eastern half. The combined population is probably over two thousand.

Both valleys contain numerous thermal springs, especially Surprise Valley; some of these are very justly believed to possess medicinal properties. The alkaline taste and temperature of the water, 100° Fahrenheit, point to desirable properties in the treatment of rheumatic affections. Unfortunately no analysis has been made.

In this connection I wish to invite attention to the desirability of placing sufficient funds at the disposal of the State Board of Health or the State Analyst to furnish reliable analyses of such springs, wherever located throughout the State, in order that the physician, ever active in the interests of the people, may at least be enabled to give an honest opinion, when asked, about the "internal use" of such waters.

I need scarcely mention that an analysis of the alkaline lakes in Surprise Valley might benefit the resources of the State by inducing enterprising capitalists to utilize these waters in the manufacture of chemicals.

## II. BOTANY OF SURPRISE AND GOOSE LAKE VALLEYS.

List of plants collected and analyzed during the Summer of 1878, in the vicinity of Fort Bidwell, California, by Assistant Surgeon W. Matthews, United States Army:

### *Ranunculaceæ.*

*Thalictrum Feudleri*, woods near sawmill.  
*Ranunculus Cymbalaria*, near hospital.  
*Ranunculus glaberrimus*, wet ground on mountain side, beyond Horan's Ranch.  
*Ranunculus Nelsonii*, near spring, behind officers' quarters.  
*Ranunculus Californica*, foothills.  
*Aquilegia truncata*, valley near stream, south of reservation.  
*Delphinium decorum*, beyond sawmill, and elsewhere.  
*Pæonia Brownii*, foothill, behind officers' quarters, and common elsewhere.

### *Berberidaceæ.*

*Berberis repens*, common in the woods everywhere; has similar medicinal properties to *Berberis Aquifolium*—Oregon Grape.

### *Crucifera.*

*Erysimum asperum*, near sawmill.

### *Violaceæ.*

*Viola aurea*, foothills.  
*Viola Nuttallii*, foothills, and near post.  
*Viola eucullata*, common in damp places.  
*Viola Beckwithii*, a variety with lower petals, partly blue, on dry, sandy ground, north of the village.

### *Caryophyllaceæ.*

*Stellaria longipes*, wood along Willow Creek.  
*Stellaria borealis*, wood along Willow Creek.  
*Arenaria Douglassii*, wood along Willow Creek.

### *Portulacaceæ.*

*Claytonia Chamissonis*, near stream west of post.  
*Lewisia Rediviva*, on dry ground north of village.

### *Malvaceæ.*

*Malvastrum*.

### *Linaceæ.*

*Linum perenne*, in the Government pasture.

### *Geraniaceæ.*

*Geranium Carolinianum*, along the streams.

### *Rhamnaceæ.*

*Ceanothus velutinus*, common in the woods and on the mountain sides, and forming the most tangled underwood on the warmer mountains.

*Ceanothus prostratus*, common in the woods and on the mountain sides, and forming the most tangled underwood on the warmer mountains. More common than the *cæanothus velutinus*.

### *Leguminosæ.*

*Hosackia Purshiana*, in shady places.  
*Dalea*.  
*Astragalus Purshii*, common in dry situations.  
*Lathyrus Nevadensis*, Goose Lake Valley.  
*Lapinus albicaulis*, foothills.  
*Lapinus rivularis*, foothills.

*Rosaceæ.*

*Rosa Californica*, common.  
*Prunus subcordata*, foothills.  
*Prunus emarginata*, foothills.  
*Prunus Andersonii*, foothills.  
*Prunus demissa*, foothills.  
*Purshia tridentata*, foothills, near hospital, etc.  
*Cercocarpus ledifolias*, sides of mountains.  
*Géum triflorum*, shady places in the mountains.  
*Potentilla anserina*, in the bottom lands.  
*Potentilla gracilis*, in the bottom lands.  
*Crataegus rivularis*, valley of stream one half mile west of post.  
*Amelanchier canadensis*, borders of all streams in and near the mountains, etc.  
*Amelanchier alnifolia*, borders of all streams in and near the mountains, etc.

*Saxifragaceæ.*

*Tellenia parviflora*, hill behind officers' quarters.  
*Ribes divaricatum*, southwest corner of Government pasture.  
*Ribes cereum*, rocks at bridge on road to sawmill.  
*Ribes sanguineum*, deep woods on mountains, one thousand to two thousand feet above valley.  
*Ribes aureum*, along the mountain streams, and in the fields east of the village.

*Onagraceæ.*

*Oenothera biennis*, parade ground, etc.  
*Epilobium paniculatum*, near streams.  
*Epilobium minutum*, near streams.  
*Gayophytum romosissimum*, dry situations.  
*Godefia vinea*, foothills, near hospital.  
*Boisduvalia densiflora*, fields east of village.

*Cornaceæ.*

*Cornus Californica*, banks of streams, common.

*Caprifoliaceæ.*

*Symphoricarpos racemosus*, in mountains.

*Rubiaceæ.*

*Galium triflorum*, common, near streams.  
*Galium boreale*, common, near streams.

*Compositæ.*

*Archillaea millifolium*, in grassy places.  
*Artemisia ludoviciana*, in desert places, common forms of "sagebrush."  
*Artemisia tridentata*, in desert places, common forms of "sagebrush."  
*Cnicus occidentalis*, foothills, near post.  
*Troximon glaucum*, on parade grounds, etc.  
*Taraxacum dens-leonis*, on the bottom, between the post and the village, some old residents say, "in 1878, that it was unknown here three or four years ago. Appears to become more frequent every year." (Kober.)

*Ericaceæ.*

*Pyrola picta*, in deep pine forests, one thousand to two or three thousand feet above the valley.

*Pyrola aphylla*, in deep pine forests, one thousand to two or three thousand feet above the valley.

*Primulaceæ.*

*Dodecatheon Meadia*, two or three varieties in moist open situations in the hills.

*Asclepiodaceæ.*

*Gomphocarpus cordifolias*, seen only in one locality on hillside, just north of creek, about a mile and a half southwest of hospital.

*Gentianaceæ.*

*Gentiana affinis*, on Lassen's Creek, Goose Lake Valley.  
*Fraseria albicaulis*, Goose Lake Valley.

*Polemoniaceæ.*

*Phlox cæspitosa*, foothills.  
*Collomia grandiflora*, foothills, west of post.



*Hydrophyllaceae.*

*Hydrophyllum capitatum*, in ravine, half a mile west of post.

*Nemophila parviflora*, at the spring in rear of officers' quarters, and many other places.

*Phacelia cinnata*, near Jopp's ranch, etc.

*Phacelia Menziesii*, foothills, immediately west of officers' quarters.

*Borragiaceae.*

*Heliotropium curassavicum*, foothills.

*Lithospermum pilosum*, on bottom lands and foothills.

*Mertensia sibirica*, woods, common.

*Eritrichium Californicum*, near race track.

*Echinospermum Redowskii*, on roadsides in the village.

*Solanaceae.*

*Petunia parviflora*, parade ground, hospital grounds, etc.

*Scrophulariaceae.*

*Collinsia parviflora*, common in valley and foothills.

*Pentstemon duustus*, Government pasture, a dwarf variety, found near the summit of Mt. Bidwell.

*Pentstemon confertus*, foothills, about a mile and a half southwest of post.

*Pentstemon laetus*, foothills, about a mile and a half southwest of post.

*Mimulus nanus*, foothills.

*Mimulus luteus*, Jopp's hot spring and other places.

*Mimulus primuloides*, summits of Warner Mountains.

*Veronica Americana*, in the pasture between the post and village.

*Veronica serpyllifolia*, in the pasture between the post and village.

*Castilleja parviflora*, mountains.

*Castilleja mineata*, Government pasture, etc.

*Labiatae.*

*Scutellaria nana*. This very rare plant was found on the first bench of the foothills, about a mile southwest of post.

*Chenopodiaceae.*

*Chenopodium album*, in cultivated grounds.

*Orchidaceae.*

*Cypripedium! candidum* (?), perhaps a variety of *C. candidum*, found only in a very limited locality, just south of the road to Goose Lake, about two hundred yards beyond the old sawmill.

*Liliaceae.*

*Fritillaria pudica*, seen about the first of April in the valley, various parts near post, and early in June on the summit of the mountains.

*Scilla esculenta*, near the lake.

*Smilacina stellata*, in moist woods.

*Smilacina racemosa*, in moist woods.

### III. CLIMATOLOGY OF SURPRISE AND GOOSE LAKE VALLEYS.

#### 1. *Temperature.*

Table No. 1 covers a period of twenty years, and may be regarded as an established standard of the climate of this beautiful mountain valley of California. It is my impression that the climate of Goose Lake Valley does not materially differ from that of Surprise Valley, except that it receives a larger amount of precipitation of moisture, in the form of snow, during the Winter months.

It will be observed that the mean temperature for twenty years is 50.3° F. This, however, should not mislead the reader, since a close analysis will at once indicate that the amount of heat is by no means equally distributed, and this would be still more apparent could the columns and

pages of individual observations be presented here. October, as regards temperature, is the typical month of the year. The mean temperature of this month for twenty years differs but two degrees from the mean annual temperature for the same period.

The highest temperature observed in any one month was 100° F., in July, 1876; and the next highest 99°, in August, 1870 and 1879. The lowest temperature in any one month was 19° below zero, in February, 1884. Absolute range during a period of twenty years, 119°. July and August are the hottest months in the year, and January, February, and December the coldest months. Frosts occur late in the Spring and early in the Fall.

A study of the tables, especially of No. 3, will indicate that a striking peculiarity of this climate is the extreme range of temperature, particularly noticeable during the months of July, August, September, and October. A daily variation of 50° is not uncommon, and even a daily range of 62° has been observed in August.

This excessive diurnal variation is intimately connected with the dryness of the atmosphere. The absence of watery vapor permits the surface of the earth to be rapidly heated by the rays of the sun, and likewise favors rapid radiation after the maximum is reached. As a result, we have often very warm days, and excessively cool nights—a very important feature of this climate from a sanitary point of view. In my discussion of some of the prevalent diseases of the community, I will have an opportunity to point out the relations of cause and effect. It may be, because the greater portion of my professional life has been spent at mountainous posts on the middle and northern plateau, where extreme ranges of temperature are especially observed, that I have become oblivious to other conditions by assuming that the great changes in temperature are the chief cause of a certain class of diseases. I shall endeavor, however, to present the facts and opinion unbiased, not doubting for a moment that elsewhere other factors may and do enter into the production of disease, and that I may be entirely wrong in my interpretation of the relations between this climate and some of the prevalent diseases.

## 2. *Precipitation.*

An analysis of the meteorological tables with reference to the amount of precipitation, will indicate that the "rainy season" during the Winter and Spring months is fairly well defined, and the amount of precipitation in the form of snow is frequently excessive.

During the Summer and Fall, or the "dry season," the amount of precipitation is hardly appreciable; whole months often pass without bringing us a shower. Dews are rarely, if ever, observed. When it is sufficiently cool at night to condense the little moisture that is in the atmosphere, without precipitation in the form of rain or snow, it is deposited in the shape of frost.

The dryness of the atmosphere is partly accounted for by the elevation, but more especially the geographical location of the valley, since the prevailing winds from the west naturally condense most of their moisture upon the western slope of the Sierra Nevadas; but there seems to be a remarkable drying power in the atmosphere of California, as shown by the frequent absorption of clouds. I have observed time and time again, even during the dry season, an ample supply of clouds and a good prospect for rain, only to be disappointed by the thirsty air.

Table No. 3 shows the relative humidity from July 1, 1885, to June 30,

1886, saturation being one hundred. The months of June, July, August, September, and even October, show the lowest relative humidity, and these are also the warmest months, and characterized by extreme daily ranges of temperature. The rainy season begins in the second half of October, and the relative humidity continues to rise until January, and then gradually decreases; exceptions are, however, frequently noted. It will be observed that the mean humidity for the year is only 57.7 per cent. Professor Parkes observes, p. 88, Vol. II: "The most agreeable amount of humidity to most healthy people is when the relative humidity is between seventy and eighty per cent. In chronic lung diseases, however, a very moist air is generally most agreeable and allays cough."

In the article on catarrhal affections, it will be shown that the greatest frequency of these disorders coincides with that of the greatest relative humidity, which, during the months mentioned, may for a few days amount to complete saturation.

### 3. *Wind.*

The prevailing direction of the wind is south and west, and is seldom observed to blow from other points, although during the severe cold weather, the wind usually comes from the north and northwest. As will be seen from Table No. 4, it is rarely violent in force, yet a gentle breeze can be nearly always observed. The maximum velocity for twenty-four hours generally occurs shortly after midnight and noon. It comes from the south during the day and from the west during the night.

### 4. *Electricity.*

Observers of this phenomena must have noticed a sensible increase in the number and violence of thunder storms on this coast within the past few years; this is especially noticeable during the present year, many of them nearly equaling an eastern thunder storm in the display of atmospheric electricity.

Two cloudbursts occurred in the Warner Range of mountains near Lake City and Eagleville, during the month of July, 1886, the water rushing down, carrying with it a large amount of debris, rocks, trees, etc.

TABLE No. 1.

*Meteorological Report of Fort Bidwell, California, from July, 1866, to June 30, 1886.*

MONTHS.	TEMPERATURE.			Prevailing Wind	Rainfall in Inches	TEMPERATURE.			Prevailing Wind	Rainfall in Inches
	Mean.	Max.	Min.			Mean.	Max.	Min.		
	1866-67.					1867-68.				
July						75.6	96	51	S.	.10
August	71.3	94	54	W.	.12	75.6	93	61	S.W.	.28
September	65.4	90	37	N.W.	.00	62.4	88	52	S.W.	.56
October	51.0	77	28	S.	.20	49.3	71	29	S.W.	.16
November	43.1	72	25	S.	.76	37.3	59	26	W.	.72
December	35.4	47	19	S.	1.16	52.7	55	9	S.W.	1.64
January	32.4	51	15	N.	2.40	10.2	40	— 18	N.	.70
February	31.3	48	12	N.	.96	14.9	43	— 18	N.	.08
March	26.6	51	0	N.	1.34	33.3	58	14	W.	.80
April						42.7	69	30	W.	1.20
May	59.3	77	43	S.	.00	52.8	83	30	N.W.	.50
June	68.6	92	44	S.	.12	61.9	85	35	S.	.82
For the year	48.4	94	0	S.	7.06	47.4	96	— 18	S.W.	7.56
	1868-69.					1869-70.				
July	71.2	95	50	S.W.	.00	73.1	94	51	S.W.	.14
August	71.8	93	57	W.	.00	71.0	97	50	S.W.	.02
September	61.6	87	45	W.	.04	60.7	85	36	S.W.	.90
October	53.3	79	28	S.W.	.01	50.5	78	31	W.	.00
November	40.3	66	19	S.	.16	43.0	74	24	S.W.	2.37
December	35.0	65	16	S.W.	1.80	31.4	57	10	S.	2.30
January	32.1	51	10	N.W.	3.80	31.6	55	2	S.W.	2.71
February	30.8	44	5	S.	.08	35.9	61	6	S.	2.30
March	41.0	67	23	S.	1.40	35.7	63	4	S.W.	1.60
April	49.6	85	30	S.W.	.96	49.7	78	18	S.W.	1.41
May	60.4	87	41	S.W.	.14	58.4	91	27	S.W.	1.43
June	70.8	97	54	S.W.	.04	64.9	89	33	W.	.68
For the year	51.5	97	5	S.W.	8.43	50.5	97	2	S.W.	15.86
	1870-71.					1871-72.				
July	76.4	96	44	S.	.76	72.9	92	43	W.	.76
August	74.2	99	38	S.	.05	72.9	91	39	W.	.02
September	64.8	88	33	S.W.	.00	61.6	84	28	W.	.40
October	49.4	79	22	S.W.	.03	49.4	79	22	S.W.	.20
November	39.1	67	21	S.W.	1.05	35.8	61	15	S.W.	1.58
December	21.7	47	— 8	S.W.	4.55	35.1	53	12	S.W.	3.25
January	31.3	46	5	S.	1.22	31.2	50	7	S.W.	1.16
February	33.7	52	17	W.	.92	37.4	56	7	S.W.	3.97
March	37.0	58	4	W.	1.00	40.2	60	21	S.W.	1.32
April	45.0	70	9	W.	.00	40.5	68	19	S.	.77
May	50.8	84	22	W.	1.94	57.6	82	28	S.	1.82
June	70.2	94	31	W.	.16	67.7	89	40	S.	.06
For the year	49.5	99	— 8	W.	11.68	50.2	92	7	S.W.	15.31

## METEOROLOGICAL REPORT OF FORT BIDWELL—Continued.

MONTHS.	TEMPERATURE.			Prevailing Wind.	Rainfall in Inches.	TEMPERATURE.			Prevailing Wind.	Rainfall in Inches.
	Mean.	Max.	Min.			Mean.	Max.	Min.		
	1872-73.					1873-74.				
July .....	70.5	93	38	S.	.00	73.8	96	43	S.	.14
August .....	69.2	93	45	S.	.26	70.7	94	38	S.	.21
September .....	56.9	83	29	S.	1.18	61.5	85	24	S.	.40
October .....	50.8	75	27	S.	.46	44.8	76	12	S.	.53
November .....	32.1	52	9	S.	1.69	40.2	57	20	S.	1.14
December .....	32.1	46	7	S.	1.94	24.8	41	— 15	S.	3.29
January .....	35.4	50	15	S.	2.22	27.7	48	5	S.	1.51
February .....	27.8	42	4	S.	1.66	25.1	49	1	S.	1.07
March .....	41.2	67	13	S.	.60	30.8	50	9	S.	1.05
April .....	42.5	72	15	S.	2.06	43.8	67	25	S.	1.12
May .....	51.5	80	27	S.	.78	55.4	80	30	S.	.64
June .....	64.1	85	32	S.	.10	59.1	86	34	S.	1.06
For the year.....	47.8	93	4	S.	12.95	46.5	96	— 15	S.	12.26
	1874-75.					1875-76.				
July .....	75.5	95	48	S.	.05	74.7	94	41	W.	.00
August .....	57.0	86	45	S.	.27	72.3	92	39	W.	.05
September .....	61.0	85	31	S.	.00	65.2	87	39	W.	.00
October .....	51.1	76	26	S.	.37	59.2	87	32	S.	1.80
November .....	36.3	51	16	S.	1.37	38.4	65	25	S.W.	2.62
December .....	30.2	52	10	S.	.13	37.2	61	20	S.	1.54
January .....	26.9	43	— 4	S.	2.10	30.0	63	2	S.	1.88
February .....	28.4	46	0	S.	.07	34.8	76	12	S.	.32
March .....	33.6	55	18	W.	2.15	38.8	80	9	W.	.80
April .....	50.7	78	12	W.	.45	50.4	80	18	W.	.53
May .....	55.1	75	30	W.	1.30	54.0	80	25	S.E.	.98
June .....	63.1	88	29	W.	1.00	67.3	97	33	S.	.43
For the year.....	47.4	95	— 4	S.	9.26	51.7	97	2	W.	10.95
	1876-77.					1877-78.				
July .....	67.4	100	39	S.W.	.11	72.0	96	46	W.	.10
August .....	61.2	90	38	S.	.00	69.3	95	42	W.	.35
September .....	62.2	91	39	S.	.00	61.6	91	40	W.	.10
October .....	49.4	87	20	S.	3.48	51.9	80	20	S.W.	.80
November .....	32.0	56	12	S.	4.32	44.7	66	27	W.	3.03
December .....	26.0	54	5	N.	.25	33.9	57	— 2	S.W.	.35
January .....	26.4	65	— 10	N.	2.00	29.6	45	— 4	S.W.	.75
February .....	38.0	69	13	S.	3.30	35.7	53	16	S.W.	4.65
March .....	43.2	80	18	S.	3.28	45.1	70	20	S.W.	2.35
April .....	47.0	82	26	S.	2.14	48.9	79	25	S.W.	1.05
May .....	50.7	80	32	S.	4.66	55.4	83	30	S.	.82
June .....	60.8	87	38	S.	2.00	68.1	90	40	W.	.20
For the year.....	47.2	100	— 10	S.	25.54	51.3	96	— 4	S.W.	14.45

## METEOROLOGICAL REPORT OF FORT BIDWELL—Continued.

MONTHS.	TEMPERATURE.			Prevailing Wind	Rainfall in Inches	TEMPERATURE.			Prevailing Wind	Rainfall in Inches
	Mean.	Max.	Min.			Mean.	Max.	Min.		
	1878-79.					1879-80.				
July .....	71.9	93	41	S.	.25	71.8	96	41	W.	.30
August .....	73.9	96	44	W.	.37	73.8	99	45	S.	.30
September .....	61.0	89	36	W.	.70	65.6	91	34	S.	.10
October .....	50.4	78	22	W.	.30	50.9	77	28	W.	.63
November .....	42.8	66	18	S.	.25	41.7	70	17	S.	1.00
December .....	32.0	57	6	S.	.20	30.4	59	-8	S.W.	.95
January .....	30.0	67	0	S.W.	1.00	31.2	60	1	S.W.	1.20
February .....	41.1	61	15	S.	2.86	31.6	54	6	S.	1.10
March .....	46.1	84	22	W.	.95	42.7	63	17	S.	.86
April .....	50.6	77	26	S.	.90	47.3	72	24	S.	2.96
May .....	49.2	76	31	S.W.	1.40	49.9	77	31	S.	2.76
June .....	62.5	90	38	S.W.	.15	65.4	85	40	S.	.26
For the year.....	50.9	96	0	S. & W.	9.33	50.2	99	-8	S.	12.42
	1880-81.					1881-82.				
July .....	73.2	91	45	S.	.72	71.7	95	48	S.W.	.32
August .....	69.9	89	41	S.	.42	72.2	97	44	S.W.	.10
September .....	65.7	86	38	S.	.05	64.7	90	42	S.W.	.24
October .....	57.8	78	26	S.	.50	49.2	79	24	S.W.	3.55
November .....	37.5	67	14	N.	.56	41.2	65	22	S.W.	2.87
December .....	38.8	66	20	S.	1.83	37.9	63	18	S.W.	3.40
January .....	34.9	64	21	S.	2.18	33.9	64	4	S.W.	3.44
February .....	41.8	68	16	S.W.	2.40	26.4	49	-12	S.W.	2.82
March .....	44.5	75	22	N.W.	.75	37.3	64	20	S.W.	1.46
April .....	55.9	80	35	S.W.	3.02	45.9	75	26	S.W.	1.72
May .....	62.0	87	34	W.	1.78	56.0	82	29	S.W.	.64
June.....	65.4	90	39	S.W.	1.59	65.5	85	36	W.	.38
For the year.....	53.9	91	14	S.	15.80	50.1	97	-12	S.W.	20.94
	1882-83.					1883-84.				
July .....	73.4	92	36	W.	.16	73.8	90	50	N.W.	.00
August .....	72.1	93	44	W.	.00	69.0	87	43	N.W.	.00
September .....	61.9	85	34	W.	.48	65.6	85	42	N.W.	.00
October .....	46.1	68	24	W.	2.73	47.8	76	27	N.W.	1.18
November .....	35.4	62	8	N.W.	.92	42.4	68	13	N.W.	1.14
December .....	37.8	70	-1	W.	3.03	38.0	71	18	N.W.	1.06
January .....	29.4	54	-18	W.	2.04	33.6	56	5	N.W.	1.14
February .....	28.8	57	-9	N.W.	.64	31.0	68	-19	N.W.	2.96
March .....	49.3	76	27	W.	.76	37.4	63	15	N.W.	.72
April .....	44.6	67	22	W.	1.56	44.2	77	28	S.W.	.68
May .....	56.6	78	27	N.W.	1.30	56.6	77	28	N.W.	.40
June.....	66.7	87	41	N.W.	.00	58.4	81	37	N.W.	4.29
For the year.....	50.2	93	-18	W.	13.62	49.8	90	-19	N.W.	13.57

## METEOROLOGICAL REPORT OF FORT BIDWELL—Continued.

MONTHS.	TEMPERATURE.			Prevailing Wind	Rainfall in Inches	TEMPERATURE.			Prevailing Wind	Rainfall in Inches
	Mean.	Max.	Min.			Mean.	Max.	Min.		
	1884-85.					1885-86.				
July .....	63.9	82	41	N.W.	.40	70.6	90	49	N.	.38
August .....	70.0	88	43	N.W.	.08	72.4	94	53	S.	.00
September .....	53.7	77	30	N.W.	1.55	64.0	88	33	S.	.09
October .....	52.8	78	25	N.W.	.73	57.6	86	28	W.	.41
November .....	46.2	70	29	N.W.	.00	41.1	74	20	W.	1.28
December .....	38.8	58	2	N.	4.10	32.2	69	15	W.	1.05
January .....	35.7	57	3	N.	1.06	32.2	55	— 2	S.	5.91
February .....	53.2	66	21	N.	2.66	42.8	64	21	W.	1.22
March .....	46.7	75	20	N.	.12	41.0	70	24	N.W.	.78
April .....	51.4	75	31	N.	3.45	44.9	72	27	S.W.	2.20
May .....	56.6	90	30	N.	1.99	56.4	85	21	S.W.	1.44
June .....	57.8	92	35	N.	2.78	65.3	92	33	W.	.78
For the year .....	52.5	92	2	N. & N.W.	18.92	51.7	94	— 2	W.	15.54

NOTE.—The mean is from the standard thermometer. The maximum and minimum observations are made with self-registering thermometers.

TABLE No. 2.

Showing the Mean Temperature of each Month for Twenty Years.

July .....	72.3	January .....	30.3
August .....	70.5	February .....	33.5
September .....	62.3	March .....	39.7
October .....	51.1	April .....	47.1
November .....	39.5	May .....	55.2
December .....	34.1	June .....	64.7
Mean .....			50.3

TABLE No. 3.

Showing the Mean Temperature at 7 A. M., 3 P. M., and 11 P. M.; the Greatest Daily and Monthly Ranges of Temperature, and the Monthly Mean Dewpoint and Humidity for each Month in the Year.

	1885.						1886.						For the Year
	July	August	September	October	November	December	January	February	March	April	May	June	
7 A. M. ....	49.8	43.7	39.5	36.6	31.7	31.2	25.4	33.4	29.0	35.2	44.3	51.4	39.5
3 P. M. ....	86.2	87.7	72.7	68.5	42.6	39.5	34.6	46.5	40.6	47.6	61.5	69.5	58.1
11 P. M. ....	71.4	71.1	56.4	52.4	38.4	35.5	30.3	40.6	36.4	42.7	54.9	62.7	49.4
Greatest daily range .....	52.0	62.0	52.0	50.0	28.0	25.0	27.0	31.0	33.0	35.0	37.0	37.0	62.0
Greatest monthly range .....	56.0	67.0	63.0	67.0	44.0	42.0	55.0	48.0	49.0	42.0	62.0	54.0	67.0
Dewpoint .....	50.1	47.2	39.9	29.5	33.3	30.9	25.8	28.7	25.3	28.7	30.6	33.0	33.6
Humidity .....	51.0	48.4	24.1	41.5	82.4	83.7	83.7	64.5	64.7	62.0	45.7	38.2	57.7

TABLE No. 4.

This Table shows the Prevailing Wind, Direction, and Average Hourly Velocity (in miles and tenths) at 7 A. M., 3 P. M., and 11 P. M., for each Month in the Year 1885 and 1886.

	1885.						1886.						For the Year
	July	August	September	October	November	December	January	February	March	April	May	June	
7 A. M. ....	N 3.4	N 3.5	W 3.2	NW 2.0	S 4.1	W 3.8	W 3.5	W 3.8	W 5.6	W 4.5	W 3.9	W 4.0	W 3.8
3 P. M. ....	S 6.7	S 5.0	S 6.7	S 4.4	S 5.9	S 5.0	S 5.9	S 6.4	S 8.4	S 8.4	S 6.9	S 7.0	S 6.4
11 P. M. ....	S 6.8	N 6.1	W 6.4	W 4.6	S 4.9	W 4.2	W 5.5	W 4.9	W 5.2	W 5.4	W 6.1	W 6.5	W 5.6



TABLE No. 5.

Showing the Number of Clear, Fair, and Cloudy Days, and the Number of Days on which Rain Fell during each Month in the Year.

	1885.						1886.					
	July	August	September	October	November	December	January	February	March	April	May	June
Number of clear days.....	24	26	23	13	1	9	7	13	10	12	12	19
Number of fair days.....	4	4	6	15	8	13	11	12	12	5	10	7
Number of cloudy days.....	3	1	1	3	21	9	13	3	9	13	9	4
Number of days rain fell.....	5	2	2	5	24	11	20	10	10	14	10	6

#### IV. REPORT ON THE DISEASES OF SURPRISE AND GOOSE LAKE VALLEYS.

*Cholera infantum*.—My six years experience in this section leads me to believe that this affection is comparatively infrequent. I have observed a few sporadic cases during the months of July, August, and September, affecting especially bottle-fed children during the period of dentition; most of the cases are of a mild type, only one death due to cerebral complications. Dr. Patterson writes: "Cholera infantum is perhaps of average frequency, but I think of less than ordinary gravity. I cannot recall a fatal case in my practice. Cholera morbus and diarrhœa might be answered in the same words, and dysentery is unknown to me in practice here."

*Cholera morbus* is rarely met with, at least medical advice is seldom sought. I have observed it only in July, August, and September, and have been able to trace it generally to a large consumption of green apples, or some similar indiscretion.

*Diarrhœa* and *Dysentery*, especially the former, prevail to a considerable extent during the Summer months. The records of the post hospital show, that during the past sixteen years, two hundred and fifty-seven cases, or 15.6 per cent of the total number of diseases treated, were reported under this head. During the Summer months, especially in a dry mountain climate, the days are often excessively hot, the thermometer rising to 98° Fah. and higher in the shade, while the nights are always cool, and frequently chilly. Improper and insufficient clothing and exposure of the surface of the body to the chilly night air, is alone sufficient to account for these catarrhal affections. The influence of the fruit season and greater alkalinity of the water due to a lower stage, furnish additional causes.

*Smallpox* has not yet visited this locality. Should the community be infected at any time, I predict a serious epidemic, as the neglect to have the children vaccinated is widespread, and simply shameful in this enlightened age.

*Measles*.—I have known of only a few sporadic cases prior to last February; they were all of a mild type, and no case resulted fatally. In February, March, and April of 1886 the disease assumed the proportion of an epidemic, affecting nearly every family in the locality. The disease was carried here from Susanville and other infected localities southwest from here. I treated over one hundred cases among the white population,

and many of the milder cases were treated by attentive mothers. There were no deaths and the disease disappeared completely in April. The poor Piute Indians fared very differently. The disease invaded their camp and attacked about ninety of their tribe, and at least seventeen men, women, and children perished from the disease. At the end of March I wrote: "If any evidence was needed to show the importance of general and individual hygiene on the influence of disease, it is illustrated by this fact, that while there was no death from measles among sixty-five whites attacked, in thirty cases occurring among the Indians, six—three adults and three children—or one in five, have thus far died. This condition is nowise due to imprudent treatment on the part of their medicine men, as they are not active, and most of the cases had received treatment at my hands." At the time I was inclined to attribute this frightful mortality to bad general and individual hygiene, exposure to inclement weather, and the irritating effects of their smoky habitations, but other factors may have determined the fatality. Dr. Patterson's experience is stated as follows: "In 1874 had some fifteen or twenty cases. In 1885 and 1886 there were probably two hundred and fifty cases from Lake City to lower end of the valley. The origin of the first epidemic, if it deserves the name, was clearly traceable to a family of immigrants, who brought the disease with them from the emigrant train on which they crossed the continent. Last epidemic appeared here by extension from the west, taking in everything as it traveled. Number of deaths, none in first, two in second (only one in my practice, however)."

*Scarlatina*.—In the Fall of 1880 I observed a few sporadic cases, whilst an epidemic was raging in the lower end of the valley, at or below Cedarville. The cases in this section were of a mild type, and yielded readily to treatment. In April, May, and July, 1885, the disease again appeared in a mild form. I treated twenty-four cases. There were no deaths, and only three of the cases presented serious complications. In April, 1886, a few cases occurred. The disease prevailed more extensively in and around Cedarville and Alturas. Two of my cases were brought here for treatment from Goose Lake Valley, infected from Alturas. Fortunately a strict quarantine prevented spreading of the disease. In the month of May two cases occurred, which were quite remarkable. Two young men, who had measles in March, returned after their convalescence to Warner Valley, Oregon, and remained at work for nearly a month, when they were brought to town with well developed scarlet fever. No other cases existed at the time in Warner, and there was no evidence of direct or indirect transmission.

Dr. Patterson writes:

Two epidemics of scarlet fever, one in 1880-1881, in which there were some twenty to twenty-five cases, with six deaths, five occurring in the practice of Dr. L. H. Kent and one in mine. Dr. Kent was unfortunate enough to have nearly all the cases occurring in families where the sanitary conditions were peculiarly unfavorable, and these seemed largely to determine the mortality. Origin unknown.

*Second epidemic* was that just passed in 1885-1886, in all probably forty cases (thirty-one of positive diagnosis, the others not typical cases, but believed to be due to the specific poison of scarlet fever). *Number of deaths* in my practice, two. There was a death in a case I never saw, but which I had reason to think was due to scarlet fever. Origin, brought from Alturas by the Boydston family.

In this epidemic, as in the other, the mortality was confined to the cases in which the sanitary conditions were bad. Both cases of mine occurred in French families, where the parents were poor and ignorant. Then, too, the boys had, just after great indiscretions in diet at the New Year holiday season, exposed themselves, while much heated by labor, to extreme cold by sitting down to rest in the snow, and then breaking through ice into the water below. As might be expected, the disease was in each case characterized by very malignant sore throat and high temperature. One boy died before the eruption appeared—the other shortly after.

*Diphtheria*.—In the medical history of the post for April, 1878, I find the following remarks: "There were many cases of diphtheria on the west side of the mountains (Pitt River Valley and Alturas), and numerous deaths therefrom during February and March. The disease did not appear in this valley until April first, six miles beyond Cedarville. It became more common in and around Cedarville, twenty-five miles from here. By the end of April the disease died out without affecting this locality, notwithstanding daily communication."

During my service here, I have observed the disease only twice, once in the Autumn of 1883, and again last May, confined in both instances to a single family. In September, 1883, it occurred in the household of a well to do farmer, who had erected a few years before a new dwelling, on a gravelly spot formerly used as a corral, little suspecting that the excrementitious matter had for years permeated and polluted the soil, and thus prepared a hotbed for disease germs. In the Fall of 1879 two cases of typhoid fever occurred in this family, affecting the father and his brother. There was only one child then in the family. In September of 1883 three of the children were affected with diphtheria, and subsequently the entire family. One of the children died from laryngeal complication. Another patient also afforded a striking illustration of the constitutional character of the disease. He was suffering at the time from a lacerated wound of the right hand, and the wound, simultaneously with the fauces, was covered with a diphtheritic membrane. The inhabitants of this house are well to do, intelligent, and cleanly, and there was no room to assume immediate or mediate contagion, unless the disease prevailed among the fowl. This family always had a larger amount of sickness than others, without apparent cause. The well was close to the house, and at least one hundred and fifty feet from the privy. Upon inquiry as to the nature of the site, etc., I was informed of its original use as a corral, cow shed, and hog pen. In view of all the circumstances, the occurrence of typhoid fever and diphtheria in this family can reasonably be connected with a local cause, viz., the water supply. There is nothing improbable in the assumption, that the animal refuse matter permeated the gravelly soil for a considerable depth, and with the recession of the subsoil water, the warm air of July and August entered the deeper layers of the soil and stimulated into activity, if not existence, disease germs which finally percolated into the well, in consequence of artificial irrigation. I am aware that it is the opinion of excellent authorities that a disease like diphtheria is incapable of originating *de novo* from defective drainage, soil pollution, atmospheric, or telluric influences, but that it is propagated by a *particulate* germ. To all such arguments I have but one answer, and that is, disease germs must have had an origin some time and somewhere. The occurrence of two so called filth diseases in a family without evidence of direct transmission of the disease, would indicate, at least, that the same soil and condition are capable of developing different disease germs. Of course neither the microscope nor chemical analysis can be invoked to demonstrate to the masses the presence of these germs, very much less of a specific germ, but that such subtle poisons do exist and are being evolved by unsanitary surroundings, the facts plainly indicate, and the amount of money expended by this family for professional services, together with the amount lost by reason of sickness, would have been sufficient to erect a new dwelling in a location not contaminated in the manner indicated.

Dr. Patterson's account of the epidemic of 1878 is very complete and pregnant with valuable facts. He writes:

Have seen quite a number of sporadic cases of diphtheritic sore throat, but only one epidemic of the typical disease, which was in 1878.

*Origin:* To me the evidence is almost conclusive that in this case the poison emanated from the large body of swamp land on the South Fork of Pitt River lying to the south and southeast of Alturas. In this county the wind but rarely blows in any other direction than from the south and west. Having premised these facts, let me enumerate from memory (my records of the epidemic having been destroyed by fire) some of the other facts which to me appear to support this theory:

*First*—Not a single case appeared to the windward of the swamp.

*Second*—Almost every child, and many of the adults living in Pitt River Valley to the leeward of the swamp, were stricken with the disease in February, March, or April of that year.

*Third*—The virulence of the disease was in direct ratio to the proximity to the swamp and the exposure to the emanations therefrom, modified, of course, by individual characteristics of the patient, and by his other surroundings.

To the northeast of the swamp, which is quite extensive, are three cañons or gaps in the Warner Range of mountains, separating Pitt River Valley from the lower end of Surprise Valley, by which the southwest winds passing over the surface of the swamp would reach the latter valley. (For verification see meteorological table.—G. M. K.) At the mouths of these cañons, and *there only*, in Surprise Valley, mild cases of diphtheria appeared toward the close of the epidemic, which was raging on the other side of the mountain range. The disease in Surprise Valley was *confined exclusively* to the families near the mouths of these cañons. In the town of Cedarville the only families affected were the two that lived directly at the mouth of the cañon, and at the mouth of each of the other cañons the one family nearest to it was the only one that suffered. (It may be well to add that none of these cañons are passable for ordinary travel except the Cedarville Pass.—G. M. K.) In all, there were thirteen cases in Surprise Valley, with no fatalities. On the Pitt River side there were, I think, twenty-one deaths among those in the immediate vicinity of the swamp, and none among the many cases at a distance of over one mile from it.

*Fourth*—The season was what we here style an "open winter," with considerable rain in February and March. The epidemic subsided shortly after the cessation of the rains, to reappear as shown in the following subdivision. (See meteorological tables.—G. M. K.)

*Fifth*—In confirmation of the theory that the disease may and does originate in decomposing vegetable matter, I give this incident of the epidemic: Mr. William Combs, proprietor of the "Combs Hotel" at Alturas, sought my advice as to how he might best protect his children from attack, it being almost impossible for him to remove them from home at that time. Acting on my suggestion, he abandoned the family rooms on the ground floor, and occupied instead the parlor and adjoining room on the second floor. His family escaped attack until June, when a great freshet occurred, causing Pitt River to overflow its banks and inundate the town site, filling all the cellars, wells, and privy vaults. His family had meantime returned to the family quarters directly over a cellar, now filled with water and decaying vegetables, which latter had been stored there while fresh for hotel use, but were now carelessly allowed to remain. Both of his children died of diphtheria, and all the adult members of his family were attacked by it, while none of the persons inhabiting other portions of the house were affected. The disease at that time was confined to those who lived immediately over the cellar mentioned, notwithstanding the very unfavorable sanitary conditions which then prevailed throughout the town.

From my sad experience in that epidemic, I cannot but believe that one cause of diphtheria is an emanation from decomposing vegetable matter. That there are other sources from which the diphtheritic poison originates, I do not doubt. My experience of the disease may be said to be confined to this epidemic.

*Croup, Membranous.*—I have seen but three cases of membranous croup in this country, two of these in connection with diphtheria in the family referred to. I do not pretend to be able to differentiate between diphtheritic and membranous croup, and believe in the unity of these affections. Dr. Patterson writes: "Infrequent in my practice, have had, I believe, two fatalities from it."

*Erysipelas.*—I have noticed quite a number of mild cases of idiopathic erysipelas in this valley, and have been led to the belief that the mountain climate may be a factor in its production. How far its comparative frequency depends upon a sudden arrest of the cutaneous functions, and the passage into the blood of the excretory products of the skin and consequent autochthonous septicæmia, I am unable to say. I have not observed traumatic erysipelas in my hospital practice, and quite rarely among the settlers; the antiseptic dressings employed may exert a salutary influence.

Dr. Patterson observes: "Erysipelas, of the cutaneous variety, rather

frequent, but probably not sufficiently so to deserve mention as being a peculiarity of this climate."

*Malarial affections.*—I find, in looking over my records, that I have reported a number of cases of intermittent and remittent fever—not a very large number, to be sure, but sufficient to attract attention. The number of cases treated among the troops, during a period of sixteen years, was one hundred and thirty-five, or 8.2 per cent of the total number of sick. This, in view of the marshy nature of some of the localities, would indicate that the cool nights of Summer do not favor the development of the bacillus malaria in sufficient numbers to prove a formidable foe. Indeed, my observations have impressed me with the belief that persons afflicted with intermittent fever elsewhere, recover in this climate. Quite a number of soldiers and civilians, although manifesting symptoms of the disease for a few months after their arrival, recovered completely. One case in particular was full of interest to me. The patient came from another locality, and in a few months was entirely free from ague; during the duck hunting season in the Autumn, he visited the tule swamps and returned with a chill; he repeated the visit two or three times, and each time had "one of his old fashioned chills;" finally, at my suggestion, which would have been offered before, only to determine the cause and effect with greater certainty, he avoided the marshes, and has not been affected with this fever since. I was informed by one of the pioneers of this valley that when the company of the Second California Volunteer Cavalry arrived here in July, 1865, a great many of the men were suffering from "chills and fever" contracted in the Sacramento Valley, where the company was mustered in, and that "after a few months they looked like a different set of men."

The few indigenous cases of malarial fever, which I have observed here, occurred in persons living in the low lands; they were by no means typical cases of intermittent or remittent fever, but, nevertheless, due to malarial poisoning. The majority of the cases treated by me were imported. In view of all the facts, as I review them, I consider malarial fevers extremely rare in this region, and the tendency in imported cases is to ultimate recovery.

Dr. Patterson writes: "Malaria, in the restricted sense, is but little felt here."

*Mountain fever (typho-malarial fever).*—In looking over my note books, I find that I have diagnosed a number of my fever cases, as "typho-malarial," and these are the cases commonly spoken of in this section as "mountain fever." I confess, that I experienced for some time considerable hesitation to regard this fever as anything more or less than a manifestation of the typhoid fever poison, but a study of the earlier symptoms especially, suggested a malarial element, which seems to modify the *materies morbi* of typhoid. Whatever the true nature of this mountain fever may be, the clinical picture essentially differs in many symptoms from "enteric" and remittent fever.

The disease is rarely ushered in by a chill, more often by chilly sensations, repeated two or three days in succession; there is always severe headache, occipital and frontal, and a severe aching in almost every part of the body; insomnia, or disturbed sleep, a peculiar furred tongue, sometimes yellowish and again bluish white, with clean red border and tip; not infrequently indications of a slight nasal or pharyngeal catarrh. The fever ranges between 101° and 104°, and in the first stage of the disease especially, shows marked exacerbations and remissions, suggestive of quotidian and remittent fever, and doubtless many of the milder cases are thus reported.

The pulse is usually full and frequent, between ninety and one hundred and ten. Epistaxis and abdominal symptoms in the early stage of the disease, are extremely rare; no eruption on the body, and in the majority of cases, constipation. Herpes febrilis are quite common. When the fever is well established, it continues for four and five weeks, with sudden and marked deviations in the temperature; there is also more sweating in the first stage than is observed in typhoid, and in my earliest experience actually interpreted the chilly sensations, fever and sweat, as symptoms of intermittent. In the graver forms, or protracted cases, abdominal and adynamic symptoms are well marked, but I have never noticed very profound cerebral symptoms.

I am not prepared to speak from personal experience of the anatomical lesions, as I have had no fatal cases. Dr. Hoff's clinical histories, published in the *American Journal of Medical Science*, for January, 1880, accord so closely with my observations, that I am fully prepared to accept his conclusions:

*First*—The fever of the Rocky Mountain region is a hybrid disease, the prominent features of which are typhoid—the modifying, intermittent; is in fact the typho-malarial fever of Woodward.

*Second*—It appears during or after exposure incident to field service, generally, though not necessarily in late Summer and early Autumn, and seems to bear no relation to typhoid infection, as now usually accepted by the profession.

*Third*—At its inception, this disease manifests itself as an intermittent of quotidian, tertian, or other form; this stage is followed (in about two weeks) by the typhoid stage, lasting in the neighborhood of four weeks, in which typical typhoid symptoms may be observed, modified to a greater or less degree by intermittent indications.

*Fourth*—The pathological anatomy of the disease, is that of typhoid fever.

*Fifth*—The treatment should be antiperiodic and antipyretic.

In regard to the origin of the fever, I have a few remarks to offer. In my observations I have been impressed with the fact, that many of the patients describe their feeling in the early stage, as having "caught cold," and there is usually some slight nasal, pharyngeal, or bronchial catarrh, but the constitutional symptoms, not unlike those of "catarrhal fever," are entirely out of proportion to the local affection. Whenever the patients report promptly for treatment, a mild cathartic, a Dover's powder, and five grain doses of quinine three or four times a day will mitigate the symptoms, and, in the majority of cases, arrest the disease; but in persons in the field or on the march, exposed to a hot sun in the day, and the chilly nights of a mountainous region, with no rest or special care, or when medical treatment cannot be at once had, the disease progresses, and after the expiration of two weeks the typhoid stage is reached, and quinine appears to have none but an antipyretic effect. *I have observed the disease in my field service to affect men who were absent for months from permanent settlements, in the uninhabited mountain regions of northern Idaho and south-eastern Nevada, where the presence of the specific germs of enteric fever could hardly be suspected to exist, and the question naturally arises, whence did the germ of typhoid fever originate in these cases?* Two sources have suggested themselves to my mind; one is, that many of our so called pure mountain streams are polluted by beaver dams and large game, not to mention horned cattle and other live stock in some localities traversed. Dr. Charles Smart, of the United States Army (vide *Am. Journal of Medical Science* for June, 1878), has analyzed the water of numerous mountain streams, and demonstrated the presence of a dangerous amount of organic matter, but this very competent observer appears satisfied that it is of vegetable origin, for he remarks: "That the organic matter was vegetable in character, was inferred from the absence of the sodium chloride which is

the invariable accompaniment of animal matter." Be this as it may, I have, within the past few years, drunk water from mountain streams which had a decided "cowy flavor," and as I have seen scores of these animals wading into the streams, my taste has probably not deceived me.

The second source is the possibility of the *materies morbi* being generated within the body, the result of certain changes of the blood, consequent upon the sudden suppression of the function of the skin. We know that this is an efficient cause for the production of numerous diseases, and that the poisonous effect on the blood acts as an irritant sometimes in one and sometimes in another part of the body, usually at the *locus minoris resistentiæ*. When this and the perforating ulcers of the duodenum, which complicate extensive burns, and which according to Curling result from the irritation due to the vicarious action of Brunner's glands in attempting to replace the deficient action of the skin—according to others, directly traceable to the formation of capillary embolism, is remembered, there is nothing unreasonable in the assumption that, in persons otherwise predisposed and subjected for weeks and months to a monotonous and faulty diet, frequent and excessive changes in temperature, and a water supply charged with organic matter, regardless of its origin, a hybrid disease should be developed combining the elements of a *septic* and *malarial* poison, and that the former may be generated within the body.

This may be at variance with the germ theory, although I do not think so, as the "germs" may be the products of the chemical changes of the blood. Many matters remain as yet unexplained. Thus, in surgical pathology, it is held that a septic condition of the wound is due to certain micro-organisms from without, and to exclude and destroy these germs is the object of the antiseptic art; yet we not infrequently see in *subcutaneous injuries* an extravasation of blood undergoing septic decomposition, especially in unhealthy subjects, and the question arises, how did the germs gain access here? The eight cases, or .5 per cent of the sick which occurred among the troops at this post during the past four years, were in recruits from Jefferson Barracks, Missouri, which appears to have been an infecting center of numerous military posts. The men generally arrived here in the second stage. My patients among the civilians were almost exclusively stockmen, who lead essentially an outdoor life, and frequently neglect the simplest rules of health, cleanliness of the body, and clothing.

Of course it is an easy matter, led by speculative considerations, to offer explanations as to the nature of "mountain fever," which fortunately is neither a frequent nor a fatal disease in this section; and whatever the origin of the typhoid element may be, the malarial element is most probably introduced into the system by the water, as my observations alluded to under malarial affections positively argue against the existence of malaria (aeriform) in this region, with the few exceptions pointed out.

It will be observed that the foregoing remarks apply particularly to a class of patients who inhabit, so to speak, a virgin soil, precluding the belief that local causes, such as soil pollution, are present to generate the typhoid element. In settled communities there is no necessity to look for extraordinary causes, such as I have suggested, as filth diseases go hand in hand with increased population.

These causes are fully set forth in the following remarks by Dr. Patterson, who, it will be noticed, has not attempted to separate mountain fever from his cases of enteric fever:

I regard mountain fever as a modification of typhoid, which has been, I think, the cause of more deaths in my practice than any other disease. I cannot approximate with any



precision the number of cases I have treated in this valley. It is certainly in the hundreds, including all the cases—grave and mild, typical and hybrid.

The mortality, I would judge, was about ten per cent. Hemorrhage from the mucous membranes occurred in probably twenty-five per cent of the cases, and in these the mortality was, of course, heavy, perhaps thirty per cent of them dying. These estimates are, of course, too indefinite to be of much value, yet I think they are pretty nearly correct.

The intimate relation observed between low water and typhoid in the epidemic form would naturally suggest the relation of cause and effect.

Low water operates in at least two ways:

*First*—By the concentration of the impurities carelessly allowed to accumulate in wells, and the consequent contamination of the drinking water. This I think the chief cause; the contamination being aggravated by the drainage from strata of soil in the well walls, now exposed to the action of the air, from which they are usually protected by the water. In many cases where wells go entirely dry, or become so foul as to be perceptibly and totally unfit for use, the people resort to the water ditches, which, flowing often in but trickling streams, for long distances through many impurities—corrals, pastures, public highways, cultivated and manured fields—are inevitably impregnated with these impurities.

*Second*—Exposure of the lake beds, with all their impurities, would, were it not for their location to the leeward of the settlements, be another source of the disease, I think, through the agency of malaria. (I use the word in its etymological sense, not in the more restricted one meaning the agency, whatever it is, that produces periodic fevers.) In this connection, I have always observed that irrigation to the westward of the home was, in my opinion, a frequent cause of typhoid. The trend of the land then favored seepage into the wells, and the prevalent winds carried the malarious exhalations directly to the dwelling places. It is one of the things I always look out for when called in these cases.

*Typhoid Fever.*—The records of the hospital for the past sixteen years show that in a total number of one thousand six hundred and forty-eight sick treated, not a single case of "enteric fever" occurred. This indicates the value of sanitation, and is doubtless due to the fact that the garrison is supplied with water from a mountain stream, conveyed in pipes to the fort, to the absence of wells, and the efficient care exercised in preventing soil pollution. The record also indicates that the disease is not *endemic* in this valley, and that when it does occur, local causes must be looked for. I have treated about forty cases among the settlers of this and Goose Lake Valley during the past six years, and with very few exceptions its prevalence coincided with the low stage of the water in the lakes, and consequent recession of the subsoil water. Professor Pettenkoffer's theory, that with the recession of the water the air penetrates deeper layers of soil and there stimulates into activity and multiplication disease germs, which were dormant so long as they were submerged in water, is perfectly applicable to the majority of cases observed by me.

I have described the gravelly nature of the soil in the two valleys, and in one of my monthly reports directed attention to the dangerous propinquity of the privies to the water supply, and firmly believe that in a large number of my cases, the excrementitious matter gradually polluted the soil and finally contaminated the water supply. A properly constructed and located privy and stable is a rarity on the frontiers. I have known large families to live on a farm for six years and over without a privy in any shape, and it is not surprising that the children should have selected, in the meantime, the most convenient spots for the deposit of human filth. The stables are not infrequently located on higher ground than the dwelling, with a natural drainage towards the house. The only wonder is that some of these families exist at all. Perhaps the system becomes in a measure habituated to these noxious influences, but when the cup is full to overflowing, they suffer the penalty for the violation of natural laws. Even the Piute Indians appear to have in many respects better sanitary ideas than their white brethren. While they are filthy, they change their camp at least two or three times a year, and in doing so, burn their hab-



itations, with all the filth and rubbish. Moreover, for the benefit of their health, they take a number of "sweat baths" during the year.

In my remarks regarding the excessive mortality which attended the cases of typhoid fever in Goose Lake Valley last Fall, I alluded to the well meant but pernicious habit of a dozen or more sympathizing neighbors visiting the patients at one time and crowding the sick chamber to its utmost capacity, and I repeat the statement here, since these reports are for the benefit of the people, that many of these poor patients died victims of mistaken kindness. Contrast, if you please, the fact that the garrison has had no typhoid fever during a period of sixteen years, and that within a stone's throw from the reservation typical cases of enteric fever have occurred; contrast then the police and sanitary condition of the two localities, and talk about the absurdity of sanitary measures, and that diseases, being a visitation of God, cannot be prevented.

Surely we have in this instance an array of facts sufficiently strong to convince the most obtuse or superstitious minds that sanitary science is based on correct principles, and that "an ounce of prevention is worth a pound of cure."

Perhaps I have given the impression that typhoid fever prevails extensively in these two valleys. I have treated twenty cases within the last two years, and should have added that this is the largest number treated by me during any similar period, and the disease cannot therefore be justly regarded as of frequent occurrence.

*Cerebro-Spinal Meningitis.*—I have never seen a case in this section.

*Consumption.*—With two exceptions, I have never known a patient to contract the disease in this climate, and these patients suffered from chronic catarrhal pneumonia. In one case, the immediate cause appears to have been a contusion or compression of the pulmonary tissue, the result of a horse rolling over his chest; in the other case, organic disease of the heart coexisted. I have observed a few patients in the incipient stage of consumption to be entirely relieved after a year's residence in this climate. A soldier who arrived here in the third stage, died shortly thereafter. In another soldier, who came to this post in 1883, the tubercular deposit underwent a rapid process of softening, and was expectorated. The disease, notwithstanding two distinct cavities in the lungs, appears to be stayed, for a time at least. Five cases, or 0.3 per cent of the sick, are reported among the troops during a period of sixteen years. Dr. Patterson writes:

Having practiced here for nine years before meeting with a case of consumption originating here, I came to believe and assert that residence in Modoc County was equivalent to exemption from this disease. The experience of later years leads to a slight modification of that belief. I have known of but four cases in all. The first, that of Mr. Parker, of Parker Creek, I believe to have been one of pulmonary consumption, but I have only a hearsay knowledge of it. He was not a patient of mine. The second was Mrs. C., of this place, in whom the tubercular diathesis was very well marked. The third was your own patient, W. P., and the fourth a half-breed Spanish boy from French's Ranch, who fell a victim to this disease, which is notoriously fatal to Spanish and other half-breeds.

I have had an experience of some half-dozen *imported* cases, and it appears to me that the very climatic influences which prevent its origin here, accelerate the progress of those already commenced; hence I think that none who have passed the pretuberculous stage should be advised to come here in hope of benefit.

*Rheumatism.*—The official records indicate that during a period of sixteen years one hundred and sixty-eight cases of rheumatism, or ten and two tenths per cent of the sick, were treated in the post hospital. During my entire service here I have observed probably a half dozen cases of acute articular rheumatism among the settlers, the majority being cases of mus-

cular rheumatism or myalgia, resulting, no doubt, from sudden changes of temperature and suppression of the cutaneous function.

Dr. Patterson writes: "Articular rheumatism, while not very infrequent, seems to bear no comparison at all in point of frequency with muscular rheumatism."

*Neuralgia*.—One hundred and four cases, or sixty-three per cent of the sick treated at the post hospital during sixteen years, were reported under this head. Neuralgia prevails more or less among the settlers, as a result of the causes just mentioned.

Dr. Patterson writes: "Neuralgia and nephritic ailments are very prevalent."

*Catarrhal Affections*.—Two hundred and forty-nine cases, or 15.1 per cent of the total number of sick treated at the post hospital during the last sixteen years, were reported under the head of catarrh and bronchitis; and reference to Table No. 6 will show that *tonsillitis* and *conjunctivitis* also furnish a large number of cases. Attention has been directed to the prevalence of *diarrhea* and *dysentery*, and their relation to climatic conditions. It may be fairly assumed that the prevalent diseases in this community are catarrhal affections of the air passages, and of the alimentary canal, rheumatic and neuralgic affections. I have already expressed the opinion that I perceive in the extreme variation of temperature between midday and midnight, and suppression of the cutaneous function and consequent retention of effete material, a very effective cause for the production of disease.

Tables Nos. 1 and 3 indicate that a very prominent feature of this climate is the dryness of the atmosphere. In my experience catarrhal affections of the air passages usually go hand in hand with the greatest relative humidity. Whether the mucous membranes, habituated for the greater part of the year to a dry atmosphere, are directly irritated by the change, or whether wet feet or the process of "catching cold" already alluded to, plays the most important role, is difficult to say. But catarrhal affections of the mouth, nose, eyes, air, and alimentary passages may and do prevail during the dry season, and I have been forced to attribute their occurrence to sudden diurnal variations in temperature, the *materies morbi* produced thereby selecting the weakest spot for its elimination. Finally, the irritation of the alkaline dust may furnish an additional cause for their production.

Dr. Patterson writes: "*Bronchitis* is more frequent than pneumonia and pleurisy together. *Tonsillitis* is a very common affection, particularly in women. Influenza and catarrhal affections are quite frequent and often epidemic."

*Pneumonia*.—While catarrhal affections of the respiratory passages are quite common, the inflammation rarely extends to the pulmonary tissue. The number of cases of pneumonia treated among the troops during sixteen years was nine or 0.6 per cent of the total number of sick. I have treated probably forty cases within six years among the settlers with no fatal results. Most of the cases occurred in the Winter months, or the season of maximum humidity. In February, 1880, the disease prevailed extensively among the citizens of Surprise and Goose Lake Valleys. The rainfall for January and February was 4.58 inches. Prevailing winds S. and S.W. But the hygrometric condition of the atmosphere alone, is in my opinion, not a sufficient cause for its occurrence. Our soldiers while on guard duty are exposed to the inclemency of the weather, both day and night, and the comparative infrequency of the disease amongst them, would

suggest, that other predisposing causes, such as overcrowding in small and badly ventilated rooms; in short, bad air, improper food and clothing, with other debilitating influences, constitute important factors in the causation of pneumonia. Just such conditions go hand in hand in families, where ten or more persons cook, eat, and sleep in a single room, about twelve by fourteen feet. When this condition is due to poverty, I can but pity the poor inmates, but when it is, as I have observed it, a question between building a good barn and dwelling, we can simply regret their ignorance of the laws of health, and the low value placed upon human life.

It is of course true, that in the army, the patients usually report very promptly for treatment, and this may account for the infrequency of grave cases, and the prevention of inflammatory conditions, but even this furnishes a striking illustration of the correctness of that old adage, that "a stitch in time saves nine." I have often been called to see patients, who had been liberally dosed with Ayers' Pills, or Kennedy's Medical Discovery, for a week and ten days, when they were actually suffering with pneumonia, typhoid fever, or some other serious disease, and I am also satisfied, that this very class of persons in case of sickness in a horse or cow, will spare neither pains nor money to obtain professional advice.

*Pleurisy* is also extremely rare in this climate: only seven cases or 0.4 per cent occurred among the troops in sixteen years. I have observed but few cases among the settlers.

Dr. Patterson's experience leads him to write: "*Pneumonia* rather infrequent and yet at times it seems almost epidemic; mortality small. *Pleurisy* less frequent than pneumonia."

*Enteritis* and *Idiopathic Peritonitis*.—I have never seen a case of either of these affections in this section, and Dr. Patterson writes: "They are almost unknown to me."

*Diseases of the Liver*.—I have treated a few cases of jaundice due to catarrhal inflammation of the bile-ducts and duodenum. Functional derangements of the liver are not uncommon, especially observed in dyspeptic patients, which will be presently referred to. I have observed a few cases of hepatitis, due perhaps to excesses in eating and sudden chilling of the body when heated. Two cases of hepatic abscess occurred in my practice among the citizens, one followed in the wake of typhoid fever, and the other without any known cause, and I can recall but three cases of chronic interstitial hepatitis (cirrhosis) in intemperate persons.

*Dyspepsia*.—In this connection I desire to direct attention to the frequency with which a large class of our settlers suffer from different forms of indigestion. Apart from sudden changes in the weather, which may give rise to gastric catarrh, the most prominent cause must be sought in the quality and preparation of food. A large number of the farmers and stockmen subsist on "hog meat," fresh, salted, and smoked, yeast powder bread, biscuits, beans, potatoes, and dried fruit, often prepared in the most indifferent way and consumed in a very injurious manner. The stockmen frequently eat but two meals a day, and often partaking of a heavy supper, go to bed shortly thereafter. As a result "biliousness" is a very general complaint. The physicians only encounter the more stubborn cases, in which "Warner's Liver Pills" and "Safe Kidney Cure" have been unsuccessfully resorted to. As may be expected, the mischief in these cases consists not only in atonic dyspepsia, but also of a chronic gastric catarrh, with more or less hepatic derangements. In consequence of these conditions, abnormal chemical changes are developed in the blood, and the different forms of lithiasis (gravel) with hyperacidity of the urine are

frequently observed. A selection of proper food, and a better knowledge as how to prepare and eat it, would render the patent liver pills and kidney cures less popular and likewise reduce the doctor and medicine bills.

*Nephritis, Acute and Chronic.*—With the exception of three cases of acute desquamative nephritis in connection with scarlet fever I have not observed the Bright's diseases of the kidneys in this community. It is not improbable, however, that the chronic forms will manifest themselves as the settlers grow older, for I can scarcely conceive how these organs can fail to be affected when they are called upon to perform an extra amount of work, in dyspeptic cases especially. The comparative infrequency of nephritis compared with repeated changes of temperature and chilling of the body, I can only attribute to the fact that the *materies morbi* selects for its elimination the mucous membranes elsewhere.

*Catarrhal Affections of the Bladder* are not infrequent in patients afflicted with indigestion, and are usually induced by hyperacidity of the urine.

*Urinary Calculi.*—Notwithstanding that the different forms of lithiasis are common I have observed but one case of stone in connection with oxaluria and dyspepsia.

*Heart Disease.*—Functional derangements are not uncommon, especially in connection with flatulent dyspepsia, but I have seen very few organic lesions, and only one case of pericarditis. Dr. Patterson writes: "Functional disorders of the heart and liver are quite common, but I do not think there is any unusual prevalence of organic diseases of these organs."

*Infantile Convulsions.*—I have observed but three cases of this affection, confined to children of a single family, and occurring in connection with a high febrile condition in measles.

*Hydrocephalus* was noted in four instances.

*Whooping-Cough* was introduced into the community by a family of immigrants, in the Summer of 1883, affecting quite a large number of children; no deaths. It would appear that the disease was limited to the upper portion of the valley, certainly within ten miles from Cedarville. As Dr. Patterson says: "I am not sure that we have ever seen it here."

*Puerperal Fever* is extremely rare, if indeed it ever occurs. I have had no case in my own practice, unless I should mention a case of phlegmasia dolens, due to a mild form of uterine phlebitis, which occurred this Spring. Perhaps the germs are not sufficiently matured as yet. Dr. Patterson writes: "Puerperal fever is fortunately very rare. In all the hundreds of accouchments at which I have attended during the last fifteen years, there has not been one fatality from this or any other cause. I am not sufficiently egotistical to attribute this good fortune entirely to skill on my part. I regard it rather as evidence of a peculiar freedom from the dangers which commonly surround the patient in such cases. I do not think that in all I have met with more than ten or twelve cases of puerperal fever; these, however, let me add, have occurred chiefly within the last three years."

## CONSOLIDATED SICK REPORT, FORT BIDWELL, CALIFORNIA—1870-1886.

Year	1870-71	1871-72	1872-73	1873-74	1874-75	1875-76	1876-77	1877-78	1878-79	1879-80	1880-81	1881-82	1882-83	1883-84	1884-85	1885-86	Total
Mean strength	67.	79.	43.	65.	87.	114.	105.	67.	83.	103.	96.	67.	81.	95.	89.	86.	
Diseases.	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	
Typho-malarial fever				1	1										1	8	1
Malarial fevers	14			6	4	22	16	6	7	2	3	2	8	13	6	8	135
Tonsillitis and other diseases of this group*	7	1	2		1	9	4	7	10	8	17	6	10	25	5	12	124
Rheumatism	4	18	3	16	11	31	13		7	9	6	3	4	12	15	16	168
Consumption	1	1							2							1	5
Syphilis																	1
Gonorrhoea, inoculation, and other diseases of this group	1	1		1	1	2			1	1	1	3		3			15
Catarrh and bronchitis				2	10	13	14	13	19	42	13	9	12		20	13	188
Pneumonia	2	1	11	5	13	27	5	15	52	32	31	6	5	17	10	15	249
Pleurisy					2	1			3	2	1						9
Diarrhoea and dysentery	1	1				2					1	1					7
Neuralgia	4	20	19	30	13	49	26	5	17	9	20	12	3	8	11	8	237
Headache, constipation, conjunctivitis, and other local diseases†	4	6	10	12	4	7	3	6	4	6	8	6	7	11	4	6	104
Total diseases	12	1	12	14	35	48	26	13	35	47	31	14	21	19	11	13	379
	50	3	70	101	1	211	167	63	137	158	132	62	73	118	86	92	1,648

\* Tonsillitis is the most frequent disease of this group.

† Inoculation and gonorrhoea the most frequent diseases of this group.

‡ Headache, constipation, cold, conjunctivitis, and indigestion prevail in the order named, and constitute the majority of the diseases of this group.

## V. CONCLUDING OBSERVATIONS.

The consolidated sick report of the garrison for sixteen years has been introduced to show the character and relative frequency of the diseases of this locality, believing that the sanitary surroundings of the troops are so excellent that fair conclusions can be drawn as to the relations of climatic influences and the prevalent diseases.

This table shows that an aggregate of thirteen hundred and seven men furnished sixteen hundred and forty-eight cases of sickness and six deaths. This, at first sight, may seem a large percentage; but it is to be remembered that in the army a great many men are entered on the sick report who in civil life would scarcely think of consulting a physician; but being incapacitated from duty by reason of a headache, colic, indigestion, or the effects of inebriation, or some other indiscretion, are excused for a day or two, and naturally help to swell the sick report. It is safe to assume that in at least fifteen per cent of the cases reported, the remote etiology was pay day or some act of indiscretion.

We find, then, that catarrhal affections of the alimentary passages lead the list; next in frequency are catarrhal affections of the air passages; then follows rheumatism, malarial fevers, tonsillitis, and neuralgia, in the order named. Due allowance should be made for imported cases in estimating the relative frequency of malarial fevers. In my experience, most of the cases were affected prior to their arrival. The absence of typhoid fever and other zymotic diseases among the troops is especially noteworthy.

A study of the meteorological tables renders it highly probable that the prevalence of the catarrhal, rheumatic, and neuralgic affections can be fairly traced to climatic influences; but these diseases are trivial when compared with those engendered by climatic conditions elsewhere. Indeed, it seems to me that the very factors which enter into the causation of these diseases here—especially the great daily range of temperature, dry atmosphere, and elevation—are destructive to other disease germs, and perhaps fatal to the development of the bacillus of tubercle. Much has been said in the article on diseases to show that many of the prevalent diseases are entirely preventible; thus the catarrhal, rheumatic, and neuralgic affections can be guarded against by the selection of proper underclothing, shoes, attention to the skin, etc.

I have expressed my opinion freely under the various subdivisions, and a lengthy review seems quite unnecessary. It has been my painful duty to point out that the occurrence of typhoid fever and other filth diseases among the inhabitants was closely connected with their unsanitary surroundings, and sufficient has been said to indicate with precision that the mortality was largely determined by these unfavorable conditions. It is doubtless true that many of our good people would gladly avail themselves of sanitary suggestions if the evils complained of could be remedied without expense; but as the subject is one largely of education, it is sincerely hoped that the principles of public and private hygiene are taught in every school in the State, and especially in country districts. In cities the sanitary regulations and police are probably the most effective educators.

From personal experience, I can vouch for the healthfulness of this climate. I came here six years ago, when thirty years of age, and weighed one hundred and thirty-five pounds, my height being five feet ten and a half inches. Having had a severe attack of pneumonia when eighteen years of age, I was justly apprehensive in regard to my lungs, which

appeared to be my weak spot. To-day my weight is one hundred and seventy-four pounds, and I enjoy perfect health, notwithstanding the fact that I am at times overworked. This change I attribute largely to the salubrity of this beautiful mountain valley.

It is hoped that this report will contribute, in a small degree at least, towards the prevention of diseases in the State of California, with its wonderful climates and resources, and convince the population of sparsely settled and recent regions like ours that it rests largely with them whether a once healthful locality shall maintain its standard or be converted by acts of ignorance and carelessness into a hotbed of disease germs.

In conclusion, I desire to express my indebtedness to my friend Dr. Wm. H. Patterson, of Cedarville, for the prompt and efficient manner in which he responded to my request for information contained in the report on diseases; and also to Mr. T. J. Patterson, of the Signal Corps, U. S. Army, for the careful and efficient manner in which he carried out my wishes in the preparation of the meteorological tables. The records of the post hospital furnished all of the data, except for the year 1885-86, which were taken from the Signal Office. My acknowledgments are also due to A. G. Heyl, Hospital Steward U. S. Army, for assistance rendered in the statistical portion of the report.

## SUPPLEMENTARY REPORT TO DR. KOBER

ON THE PREVAILING DISEASES ABOUT ALTURAS AND SOUTHERN END  
OF GOOSE LAKE VALLEY.

By J. M. FORREST, M.D., Correspondent of the Board.

ALTURAS, August 10, 1886.

MY DEAR DR. KOBER: I have been practicing here nearly eight years. In that time I have not seen nor heard of eight cases of pneumonia in an estimated population of two thousand two hundred. I have seen only one case of consumption (Blurton) which I suppose to have originated here. I have seen two imported cases—one from the East and one from San Francisco.

Acute peritonitis and dysentery I have not met. Muscular pains and aches, common; some rheumatism; some neuralgia. Functional derangement of liver very common. Articular rheumatism rare; have not seen more than two or three cases. Digestive derangements very common, frequently considered kidney trouble by patients on account of copious deposits of urates. Organic disease of kidney rare. I know of only one case of diabetes mellitus, and two or three of Bright's disease in old men. I remember only two cases of erysipelas. I have seen only two cases of true diphtheria; they got well. They caught the disease in and from rooms where persons had died of diphtheria.

Malaria does not cut a figure in my practice. I know nothing of typhomalarial. Typhoid fever has been sufficiently common. My experience with it has been, those cases treated from the beginning get well. Those are *doubtful* which run on two or three weeks before a doctor is called in. Many cases get well without any treatment. I think it quite possible that

our continued fevers may be caused by a typical typhoid germ, and again by a germ resulting from putrid or decomposing animal matter. However, I have not time to enter into this. Measles has been a mild disease with us. Searlatina has been hydra-headed. 'The first two cases I saw in the county were malignant and fatal; yet they were contracted from a member of a family all of whom had had the disease in a mild form, and got along (so reported) without medical treatment. The third case was an isolated one in the country; it got well. In our late epidemic, the fatal cases were *terrible* from the start, and were wholly beyond the control of medicine. Two cases, boys—little boys, playing together—presumably infected from the same source. One, malignant, from the outset, died; the other, scarcely sick enough to remain in bed twenty-four hours. Influenza has been very common; quinsy, also. In connection with both have been some cases of follicular pharyngitis, simulating diphtheria. There have been three or four cases of croup—one was fatal—at a time when no disease was endemic or epidemic.

With careful hygiene, I believe typhoid and kindred fevers would be unknown in Modoc. We (the people) are largely to blame for the sickness in our midst. Privies and wells are too close neighbors. With a pure water supply and ordinary cleanliness, there would be no endemic disease in this portion of the county. I regret, my dear doctor, that this report is so meager.



## COAST CLIMATE OF CALIFORNIA.

By JOHN W. ROBERTSON, M.D., Crescent City, Del Norte County, Correspondent of the Board.

The coast climate of California possesses many peculiarities which distinguish it from that found elsewhere in the United States, and which preëminently recommend it to the health-seeking invalid.

These peculiarities consist in uniformity of temperature, the distribution of rain, and the fact that there are only two seasons.

### TEMPERATURE.

The temperature varies little Summer or Winter. There is not the innervating Summer heat which characterizes the interior valleys, nor, in Winter, is the rain so constant or disagreeable as to forbid outdoor life.

In no Winter month is the average temperature below 45°, nor, in Summer, does it rise above 60°.

As Chairman of the Committee on Medical Topography, I made a report to the State Medical Society, in which this uniformity of temperature was discussed, as follows:

While the climate of California is mainly due to its situation, midway the temperate zone, the remarkable uniformity of temperature is due to local causes. The great law that, in the northern hemisphere, all western coasts are warmer than the eastern, is peculiarly well pronounced when the eastern is compared with the western coast of the United States.

The mean isotherm of 50°, which passes through New York, latitude 41°, bears northward as it crosses the continent, touching the Pacific at Vancouver's Island, latitude 49°.

Nature also draws isotherms in her distribution of trees and plants. While, on the eastern coast, 60° is the northern limit of coniferæ, they are found as high as 68° and 70° in regions adjoining the Pacific. It is thus evident that the climate of Northern California is much more temperate than that of the Eastern States which are situated in the same latitude. This does not hold true of Southern California. Here the conditions are reversed. San Diego, in the same latitude as Charleston, is 8° cooler. San Francisco and Washington, in the same latitude, and having the same mean annual temperature, have climates very dissimilar, owing to the great difference between the mean Summer and Winter temperatures of Washington, which amounts to 40°; and the small difference in San Francisco, being not over 8°. The mean annual temperature of Santa Barbara is 60°, that of San Francisco is 55°; nor does it fall below this on the northern coast. In Crescent City, latitude 42°, the temperature is as uniform as in San Francisco, frost and snow being of even rarer occurrence.

Isothermal lines, which normally run east and west, are, as they near the Pacific, deflected north and south, and define three distinct climatic belts. These may be named: coast, valley, and mountain; and while they resemble each other in having only two seasons, they are dissimilar in other respects; each presenting peculiar attractions for different classes of invalids. These differences depend upon the topography of the country, and are of degree rather than kind; altitude, distance from the ocean, and situation with reference to mountain chains, giving to each region its characteristic climate. That of the coast extends only a few miles inland, but stretches six hundred miles north and south. It is characterized by a mild temperature, which varies little Summer or Winter, a fresh sea breeze during the warm part of the day, fog in Summer, and an abundant downpour of rain in Winter. Here perpetual Spring is found, the trees being principally fir, spruce, and redwood, and the grass always green, the vegetation presents, both Summer and Winter, a pleasing contrast to that prevailing in the valleys and mountains of the interior. It is proper to include in this a large part of the inhabitable region of Southern California. There the hills of the Coast Range, being low, offer little resistance to the cool ocean breeze, and the effect is felt for many miles inland. The heat incident to the valleys greatly moderates them, removes all rawness, and the result is a balminess exceedingly grateful to the invalid.

That there should be a region stretching over eight degrees of latitude north and south, the temperature of which is mild and practically constant, is phenomenal. For its explanation we must look to the Japan current, which flows down our coast. This current separates from the equatorial as it leaves the Indian Ocean, flows northwest along the coast of Asia, and, off Kamtschatka, divides. One branch is directed north into the Arctic Ocean through Behring Strait. The other flows westward until it reaches Alaska, where it is deflected south, closely embracing the coast lines of Washington Territory, Oregon, and California.

When the Japan current leaves the Indian Ocean its temperature is 90°. As it flows northward this temperature decreases. Off the coast of Japan it is but 70°, and, as it goes north, the temperature is further decreased, but not so rapidly. Off the coast of California it is from 55° to 60°, and it rises but little in its course southward.

The westerly winds of Summer and the southwesterly winds of Winter bear with them the uniformity of temperature of this large body of water, rendering the temperature of the coast warmer in Winter and cooler in Summer than it would otherwise be. It also equalizes the temperature along the whole coast, giving to Santa Barbara—latitude 34°—almost as cool a climate as has Crescent City, latitude 42°.

These westerly winds are in accordance with the well established law that there are "three distinct belts in each hemisphere, namely: the belt of easterly winds, within the tropics; the belt of westerly, within the temperate zone; and the belt of northwesterly, at the north."

The west winds of Summer are greatly intensified by the heat, incident to the great interior valleys lying east of the Coast Range. The heated air rising from the Shasta, Sacramento, and San Joaquin Valleys, and the sandy plains of Tulare and San Bernardino, leaves a vacuum which the sea breeze rushes in to fill. This breeze is unusually strong wherever there is a gap in the Coast Range leading into any of the great valleys. The topography of the western coast is such as to allow no conflicting element which would tend to materially modify this general law of temperature.

The Rocky Mountains, starting from the northern coast of Alaska, stand as a great barrier, warding off, to a great extent, the cold winds flowing southward. Were it not for these mountains, which break the force of this polar wind, and the still greater protection afforded by the Cascade and Sierra Nevada Ranges, California would, in all probability, be overwhelmed with some of those terrible blizzards which are of such frequent occurrence in the Western and Northwestern States and Territories.

#### DISTRIBUTION OF RAIN.

The distribution of rain is so anomalous as to be worthy of mention. The general law that the annual rainfall is greatest near the equator and diminishes about two inches for every degree of latitude north is, on this coast, reversed. The annual fall of rain at San Diego averages nine inches, increases to twenty-four at San Francisco, and rises to eighty inches at Crescent City, near the Oregon line, figures that the topography of the country only in part explains.

The temperature of Southern California is so mild and the Coast Range so leveled, that little influence is exerted on the vapor bearing southwest winds. Northward, the Coast Range rises, causing a greater precipitation of rain, which is intensified when the Coast Range intermingles with and is overtopped by the snow capped Siskiyou.

North of Cape Mendocino the annual rainfall suddenly rises from thirty-

five to sixty inches, without any accompanying change of mountain formation adequate to the production of such a result.

Professor John LeConte, in discussing this increase of rainfall, says that it "is a striking but very puzzling fact. We are not yet prepared to offer any satisfactory explanation of it. So far as we know, there are no observations indicating any sharp and sudden depression in the temperature of the ocean waters just at Cape Mendocino."

One factor of this increase is the vast forests which act powerfully both as attractors and condensers of moisture. While the Coast Range, even south of San Francisco, is covered with timber, the forests do not compare in extent with those which clothe the higher ranges of the north. The sudden increase of the annual rainfall is coincident with the commencement of these forests.

The verdict of the most eminent authorities on this subject is by no means unanimous. A very small minority claim that the effect of forests is nil. The very great majority assert that they have an effect; some claiming that they only act by retaining moisture, others that they sensibly increase the rainfall. They base their opinion upon the changes produced by cultivation and tree planting, as well as by the disastrous effects of mountain denudation.

In a very able paper which appeared in the transactions of the State Medical Society for 1883, Dr. Chipman discusses the subject, and brings strong evidence to support the judgment of those who believe in an increase of rainfall. It is possible that tree planting has not, as yet, had any great influence, for the land so redeemed is of small extent, and the trees but of a few years' growth. The results following denudation should be the criterion.

Certainly a densely wooded country and a large rainfall go together. Of course, it may be claimed that the forests are a result, rather than a cause; but the result of the destruction of immense forests has been so pronounced as to render the converse probable.

Should it be a fact that these moisture-attracting forests aid powerfully in increasing the rainfall, we can, with certainty, predict a result that will soon occur in the distribution of rainfall on this coast.

Man, after a most reckless fashion and with all modern appliances, is rapidly destroying what nature during the last thousand years has so generously produced. Within twenty years the mountain sides will be bare, and where redwood measuring fifty and sixty feet in circumference stood thickly rooted, dead stumps will be the only proof of former grandeur.

Some contemplate this change with alarm. In all probability the results will be extremely gratifying. The immense forests no longer attracting, the rain-laden clouds will be more evenly distributed, the rainfall in the southern counties largely increased, and artificial forests may yet clothe their hillsides, materially modifying their heat and purifying the atmosphere, causing the now barren plains to bloom, and thus add new charms to a region already famous as a sanitarium.

The topography of Northern California will assure to that region a bountiful supply of rain, though it may no longer be deluged with the six feet of water which falls during its five Winter months.

This is not altogether theoretical. Already have vast tracts of forests been destroyed, and the result has been a most wholesome change in the climate. The annual rainfall has perceptibly diminished and the fogs which, formerly, during the Summer, enveloped this region, are growing lighter yearly.

So pronounced has this change been in Crescent City that the climate, formerly disagreeable by reason of fog in Summer and continuous rain in Winter, has so moderated in the last few years that fog is comparatively infrequent, and the rainfall has diminished, how much it is difficult to say, as observations conflict.

It is proper, in this place, to notice the difficulties which arise in the study of rainfall on this coast, and the many sources of error to be avoided. The United States Signal Service has established stations along the coast, where the temperature, velocity, and direction of the wind, and the rainfall, are recorded. As a rule, the men chosen to keep this record are those who have shown a desire, as well as a natural adaptability, for such work, and their reports are reliable.

On the other hand, the reports from certain military posts are to be looked on with suspicion. The observers usually selected are the Post Surgeons, and, too often (I speak from personal knowledge) the duty of recording observations is delegated to the Hospital Steward, who, from the recesses of his inner consciousness, draws up a report that reads well, but which has not the slightest foundation in fact.

Another most important source of error, and one difficult to correct, is that of accurately measuring the rainfall. For this purpose the Signal Service Bureau has recommended to each observer a receiving can, which is to be placed in the most open spot available. When the water falls perpendicularly this can will be an accurate register. As a rule, the coast rains are accompanied by winds of high velocity. This wind will vary the amount of rain caught in the receiver; for it is evident that more rain would fall in a receiver, the plane of which is perpendicular to the plane followed by the drops, than in one where these planes are at an angle less than ninety degrees, and the decrease would vary directly as this angle.

If the surface of the earth were absolutely level this might represent the actual rainfall, but, on every hand incline planes arise, such as sloping hillsides, and other elevated obstructions, forming inclined planes. These planes, making greater angles with the lines of incidence, receive a double portion, and the result is a raise of the average rainfall. This error can be overcome by taking the velocity of the wind in any given storm and calculating its disturbing effect.

Again, the wind, meeting with obstructions, throws the drops into vortices and currents, materially interfering with their fall. Should the receiver happen to be in this current, the result recorded would be far too great. Although the Signal Service Bureau has recommended the adoption of a standard gauge, placed at a certain height above the ground, their suggestions have not, in all cases, been adopted.

For these reasons the reports of the Signal Service Office should be taken with many grains of salt. Even were the gauges absolutely accurate, only approximal deductions could be drawn from the reports sent in. The only general law that has so far been established is that the rainfall of the coast increases towards the north. The stations are too far apart.

Before we can give a true report of the rainfall of any given section, rain gauges should be placed on at least every square mile of the territory reported. A failure to avail itself of all sources of information obtainable, and an implicit reliance on figures reported, without taking into consideration modifying and extenuating circumstances, has, in certain instances, led to serious mistakes.

A most notable example of this is the one hundred and five inches given as the rainfall of Crescent City, and presumably, of the surrounding country.

This leads all other localities by four inches, and all other coast stations in California by sixty-four inches. Crescent City is situated on a bight of the ocean, in latitude 42°. The keeper of the signal station is a man of unusual scientific attainments, accurate and painstaking. He has done his work honestly and faithfully, and, beyond all question, one hundred and five inches did fall in his receiver. He has placed his gauge, five inches square, in an open space about two hundred yards from the ocean, near the margin of a slough. The topography of the country is such as to direct the wind currents, and consequently, the vapor-bearing clouds, along this line, and it is probable that more rain falls in this locality than in any other place in Crescent City. At the lighthouse, one half mile away—also on the coast—another rain gauge is kept. The observer is equally accurate, and his report is altogether as reliable as is the one adopted by the Signal Service. He has kept a daily record of the state of the weather and the direction of the wind since 1877, but the amount of rainfall has been registered only since April, 1883. His rain gauge is circular, two inches in diameter, and is situated on a promontory sixty feet above the ocean. The following table represents the number of rainy days for the last three years, together with the rainfall as registered, both at the Signal Service Station and the lighthouse. September has been selected as the initial month, for during this month our rainy season begins:

MONTHS.	1883-1884.			1884-1885.			1885-1886.		
	No. of rainy days	Rainfall Signal Service Station	Rainfall Lighthouse Station	No. of rainy days	Rainfall Signal Service Station	Rainfall Lighthouse Station	No. of rainy days	Rainfall Signal Service Station	Rainfall Lighthouse Station
September .....	2	4.56	3.68	9	7.23	4.25	2	1.96	1.33
October .....	11	8.35	5.05	5	5.24	3.37	6	3.77	1.48
November .....	3	3.36	2.06	4	7.12	2.47	21	30.78	16.56
December .....	2	9.65	.84	16	27.01	15.25	16	22.26	14.25
January .....	10	11.45	7.84	17	11.32	7.96	14	18.28	7.96
February .....	15	7.89	4.23	13	9.30	6.61	8	9.14	4.50
March .....	15	9.61	7.69	3	.84	.74	14	9.00	4.98
April .....	13	10.39	6.39	4	1.32	1.02	15	8.59	5.56
May .....	5	2.01	1.23	6	1.53	1.17	6	1.50	1.64
June .....	4	2.08	1.50	2	.80	.24			
July .....	1	.15	.05						
August .....	1	.06	.03						
Total .....	82	69.56	40.59	79	71.71	43.08	102	105.28	57.69

That two stations, one half mile apart, should give a difference of fifty inches is, to say the least, remarkable. As I have before said, the accuracy and honesty of neither observer can be questioned. The explanation must be found in the form of the receiver, the difference of location, and the centralization of the vapor-bearing clouds.

The most glaring discrepancy is the amount of rain reported to have fallen during the month of December, 1883—9.65 inches having been registered at the Signal Service Station and only .84 at the lighthouse.

In a memorandum book I find the number of "cloudy and rainy" days for this same month to be six, but I cannot vouch for its absolute correctness. A careful study of the records reveals some interesting facts. The storms last from two days to a week. They are ordinarily preceded by a southeast wind. This wind may last from a few hours to two days, and it

is possible to predict the length of the storm by observing the length of time this wind precedes it. When the wind veers to the west or north-west, clear weather follows in a few hours. During the Winter there is no fog, and very seldom is there mist. When it rains, the downpour is incessant. The greatest amount registered by the lighthouse gauge for any one day was 2.97 inches on the twenty-fourth of December, 1885. On the same day the Signal Service Station registered 4.16 inches. Such an amount is unusual, though frequently the register marks an inch or more for even one day's storm. To really comprehend how much an inch of rain is, it must be remembered that on every acre, during a storm that registers an inch, nearly twenty-seven thousand gallons of water fall; or, on a square mile, about twelve million four hundred and twenty thousand gallons. Did one hundred and seven inches fall, the result would be fearful to contemplate. No dependence is to be placed on the 81.59 inches of rain supposed to have been registered at Camp Lincoln, six miles from Crescent City, which has been so often quoted in tables of rainfall. That figure and the accompanying details were the result of pure imagination.

As to the comparative value of the figures in the above table with reference to the real amount of rainfall, little can be said. It is probable that the figures of the lighthouse come nearer representing the average rainfall than do those of the Signal Service. They certainly more nearly agree with the reports sent from our coast stations. It is probable that a like uncertainty exists as to the amount of rainfall in other localities, were it possible to sift all facts. For instance, there is a difference of ten inches between the rainfall of the lighthouse near Eureka and a gauge kept in that town.

Too implicit confidence is liable to result in fallacious inductions.

*Wet and Dry Seasons.*—From the middle of May till the middle of September, rain seldom falls. The Winter rains, as a rule, do not commence before October or November. It has been asserted by a high authority that south of Cape Mendocino, latitude  $40^{\circ} 20'$ , but little rain falls during the three Summer months, while north of this point the rains are more evenly distributed throughout the various seasons. Rains are as unusual during June, July, and August, on our upper coast as in San Francisco. The same record that gives Crescent City one hundred and seven inches of rain for the Winter months, makes the rainfall for the three Summer months of 1882, .81; 1883, .41; 1884, 2.39; 1885, .80 inches.

In Shasta Valley, due east, but separated from this coast by the Siskiyou Mountains, Summer rains are of frequent occurrence.

*Dry Summers and Winter Rains.*—Where, within the tropics, the north-eastern and southeastern trade winds meet, is a region of calms and rains. This belt of calms and rains, as has been stated, moves northward and southward with the sun's declination. Where, within the temperate zone, the northern and northwesterly winds from the polar regions meet the westerly return trade winds, is a region of storms and rains. These belts also follow the sun's declination north and south. Applying these laws to this coast: At our midsummer, the vertical sun would be on the tropic of Cancer, and, in that vicinity, the northeasterly and southeasterly trade winds would meet, create ascending currents, consequently calms; this air, laden with moisture, would rise into cooler regions, when a portion of its moisture would be precipitated, making tropical rains; it would then flow north and south towards the poles. Confining our views to that portion which would flow toward the north pole, the larger part of it must descend to the earth within  $30^{\circ}$  of latitude, under the law, as stated by Professor Henry; as in going

north it continually has to pass over a portion of the earth which is moving less rapidly than the portion it has left, it is deflected and becomes a south-west wind. The greater part of this upper current having descended to the earth within  $30^{\circ}$  and returned to join the trade wind, the remainder would flow toward the pole, portions descending in its course at all points where the rarefaction of the air near the earth's surface would permit. These descending currents cause the local variable winds of our temperate zone, but the aggregate of all of them is the prevailing southwest return trade wind. The descending currents cannot give rain, as they only fall to the earth when they become colder than the air near the earth's surface. In falling they are constantly arriving at places of warmer temperature than those they have left: therefore they change to a condition of taking up moisture, rather than of parting with it. Where the great body of the descending return trade wind reaches the earth between latitudes  $28^{\circ}$  and  $35^{\circ}$  must, therefore, on this coast, be comparatively a rainless region. Other lessening portions of the upper current would pass on until they met the prevailing northerly wind from the polar regions, when their temperature would be lowered and their moisture condensed and fall as rain. The conflict of this descending current with the polar wind would create storms and give rise to electrical phenomena. The prevailing northerly polar wind reaches to about latitude  $60^{\circ}$ , varied by the declination of the sun.

The cause of this dry season is supposed to be the return trade winds deprived of their moisture, which prevail during the Summer months.

On the other hand, beginning in September, the wind currents are from the south. These winds are saturated with moisture from the Gulf of California and other southern tropical seas. They lose but little moisture passing over the hot deserts and valleys of southern California, and it is only as they reach the cool coast, from Santa Barbara northward, that they deposit much rain. The further north they go the more are they affected by the coolness incident to a higher latitude.

For the same reasons it has been supposed that moisture-bearing west winds would deposit more rain in the northern than in the southern part of California. It is not probable that this increased rainfall is due altogether to a colder latitude. The temperature is not such as to be a powerful condenser. The mercury seldom falls below  $50^{\circ}$ , and, if it were this temperature that condensed the moisture of the west wind, this condensation should take place in the Summer as well as the Winter, the variation in temperature between these seasons being slight. During the months of October, November, and December, 1885, an unusually large amount of rain fell on the northern coast, but, during this time, the temperature did not fall below  $60^{\circ}$ , and no snow fell either on the Coast Range or in the Sierran Mountains.

Professor John Le Conte has suggested the possibility of a cold counter current going north which hugs the shore and which might act as a condenser. Another possible explanation is the influence of the immense forests already mentioned.

#### COAST CLIMATE.

The annual temperature of the coast ranges from  $45^{\circ}$  to  $60^{\circ}$ . Snow is a most rare visitor, though, at intervals of a few years, there is a slight fall. In the early Spring months frost occasionally occurs.

To one accustomed to the innervating heat of the great interior valleys, a sudden change to the coast is not pleasant.

The ocean breezes are possessed of a peculiar "freshness" that sends unpleasant chills through the newcomer, unless he be unusually vigorous.



A few weeks residence changes this rawness into an agreeable state of invigoration, and there is a sense of buoyancy and vitality experienced in no other climate.

The therapeutical effect of the climate is essentially tonic and suited only to certain classes of invalids.

Diphtheria, puerperal, typhoid, and malarial fevers are unknown. The exanthemata seldom occur, and, when they do, they appear in their mildest form. This does not hold true of those large towns on the coast whose intrinsic uncleanness is often sufficient to partially overcome and destroy the purifying effect of the ocean breezes.

On the other hand, certain diseases are so frequently met with as to render it almost certain that they are fostered by our peculiar climate. These are rheumatism, neuralgia, bronchial affections, and diseases of the liver.

There is no reason to suppose that this climate would not favorably affect consumption, provided it is not accompanied with serious bronchial lesions. Possibly experience will prove what theory points out, viz.: that this is the climate *par excellence*, for it combines tonic qualities with a temperature so moderate as to permit of outdoor exercise at all times of the day. Patients should be warned against "overcoat colds." Underclothing, composed of flannel or chamois leather, will prevent much of the discomfort complained of by those who are thin blooded.

#### THERAPEUTICS OF THE COAST CLIMATE.

It is presumed that certain diseases known as endemic depend on location, and that they are the result of contamination of either soil, air, or water. This influence has been noted from the earliest date of recorded medical observations. Hippocrates thus begins his essay on "airs, waters, and places:" "When one wishes to properly investigate diseases, he should begin as follows: After first taking into consideration the seasons of the year, he should watch the effects they produce, for these effects vary with the changes of the seasons. Then the winds should be watched whether they be hot or cold, not only those that are common to all countries, but more especially such as are peculiar to one place. \* \* \* Likewise, when one enters a city with which he is unacquainted, he should observe with care its situation with reference to the wind and sun. Its influence varies with its situation, north or south, to the rising or the setting sun."

The malignant "east wind," so often mentioned in sacred and profane histories as being loaded with miasms, plagues, and as an instrument for the accomplishment of divine justice, was nothing but the dry, hot, scorching simoon, the injurious effect of which was due solely to the fact that it absorbs moisture, not only from trees and plants, but from animals as well, rendering the mouth, throat, nostrils, and bronchial tubes, dry and parched, and, by its great power of absorption from the skin, drying up the fluids of the body. It is this wind which, in the early Summer months, prevails in the Sacramento and San Joaquin Valleys, blasting vegetation, and bringing latent diseases into activity. It is because of this rapid evaporation from the skin that the great heat (sometimes, and possibly erroneously, registered as 120° and over) is borne. This evaporation cools the body, and renders the heat bearable, but, for reasons just given, it is not the unmixed blessing so often claimed. Its therapeutical effect is worthy of an investigation more thorough than has yet been given it, and which can only be successfully prosecuted by a resident observer.



Beyond all question, certain districts which are characterized by altitude and dryness present a class of diseases very different to those where the ground is low, marshy, and composed of decayed vegetable products; or, again, sudden changes from hot to cold—from an atmosphere dry and absorbent, to one saturated with moisture, and more especially when these changes bring with them obscure aches and pains, and a sense of uncomfortable restlessness, which is popularly, and probably correctly, attributed to electrical influence—would produce a class of diseases radically different to those found in a climate the characteristics of which are an equable temperature, a moisture-bearing, and, as experience seems to prove, a “germicide” wind, fogs, and an infrequency of electrical manifestations. This latter contrast is presented on comparing the climate of the valley with that of the coast, separated by a range of hills parallel to and distant from the ocean five to twenty miles. There has been no systematic series of observations on the influence of coast climate over disease, and the first attempts in that direction will necessarily be crude. The foundation of facts so far collected is small, and while the inductions drawn from them may be faulty as to detail, yet I am fully persuaded that future observations will prove the general outline here given to be correct.

There is a direct influence exerted over those diseases which are supposed to be caused by external morbid agents: erysipelas and influenza being at times endemic, while other general diseases, such as typhoid, relapsing, scarlet, malarial, and puerperal fevers, variola, and diphtheria are either unknown or appear in a mild form. This statement holds good for the region directly along the coast, over which the winds have full play; yet there are some factors which, in certain localities, tend to vary it. The most important of these are filth, decaying vegetation, and impure water. When the population is dense, especially in made ground with faulty drainage, filth diseases are found.

The peculiar influence exerted by climate is well illustrated by a study of the diseases prevalent in Crescent City and the region surrounding. Crescent City is situate directly on the coast, many of the houses having been occupied as dwellings over thirty years. Sanitary precautions are absolutely ignored; consequently filth of all kinds is abundant. Few houses have drains extending further than the back door. A large colony of Chinese are, as usual, located in the center of the town, and the effluvia from their dens is sickening. They so drain their water and filth as to form cesspools in the streets. Water is found at from five to ten feet beneath the surface, and, being only a few yards from the ocean, is brackish. The inhabitants depend altogether on these wells for their water supply; and, being sunk in porous soil and surrounded by cesspools and deposits of filth, they must contain water saturated with organic impurities. The sense of smell will often detect these, and the rudest tests prove their abundant presence.

From these hygienic surroundings, the *a priori* deduction would necessarily be that every essential feature of a death-trap is present; in fact, it would appear that the most diabolical ingenuity had been exerted to assure large mortality reports; still, I venture to assert that a more healthy town cannot be found upon the face of the earth. Though the population is over one thousand, during the last five years but four children under five years of age have died, nor could their deaths be attributed to those diseases peculiar to children.

The adult mortality is equally light, most of the deaths being the result of diseases of the heart, liver, stomach, lungs, and apoplexy.

This immunity from the diseases enumerated cannot be attributed to accident. They are the products of filth, and follow, with unerring certainty, the footsteps of civilization. Where there are a few houses collected, where forests are destroyed, vegetation rots, and streams are stagnant, wherever drainage is neglected, these diseases appear. The coast belt owes its healthfulness, not to sanitary precautions, but to temperature and wind. Their *modus operandi* is not known.

In recent years much study has been given to the etiology of these diseases. Brilliant bacteriological discoveries have been made. Most confidently has it been asserted that the bacilli of malaria, cholera, typhoid fever, diphtheria, phthisis, etc., were discovered. In a recent publication Sternberg notes sixty-five different bacilli, forty-one of which are pathological. No one doubts the presence of these bacilli, and while all who look hopefully on the future of medicine, who would see it raised from an art to a science, eagerly await future investigations to confirm, it must be confessed, that cause and effect have not, as yet, been established. Taking for granted that the germ theory is correct, the explanation of the healthful effects exerted by the coast climate is simple: though certain germs may be present, they do not luxuriate in a climate whose temperature is moderate; and that certain of those which are present are destroyed by the wind. That our healthfulness is mainly due to the wind cannot be doubted. It may act mechanically by blowing and scattering the germs, or, what is more probable, it possesses an inherent germicide power; for certain acute diseases, such as influenza, whooping-cough, rheumatism, and erysipelas are of frequent occurrence. Why erysipelas (idiopathic) should be at times endemic and puerperal fever occur so infrequently, I cannot conjecture, unless it be that the germs of one flourish in a cool climate while the other demands heat for its proper development. The only case of puerperal fever that I have seen here occurred during a spell of unusually warm weather and very near the residence of a person who, a month before, suffered from an attack of idiopathic erysipelas. Though, because of the destruction of forests, there is much vegetable decomposition, malaria is seldom found. When brought from the interior it immediately assumes a remittent type and, without medicine, will often terminate in recovery. Measles and scarlatina have been epidemic, but they occur in a form so light as to be scarcely recognizable—seldom confining the patients to bed. On the other hand, in whooping-cough, the symptoms are usually intensified and a residence away from the coast is often made necessary for its cure. In Crescent City and the country surrounding there has never been an authentic case of variola, diphtheria, or typhoid fever. In the main this assertion holds good for the coast, except in those centers of population where the inherent impurities overcome the sanitary influence of the climate, or in regions away from the coast and sheltered from the winds. This wind, besides possessing moisture and coolness, is surcharged with ozone, and much of its influence is to be attributed to the oxidizing power of this agent.

Certain chronic diseases are attributable to the secondary effect of this climate. Californians (and, by Californians San Franciscans are usually meant) live a notoriously fast life. Persons coming to San Francisco from the interior valleys or the East are, at first, chilled by the cool, fog-bearing wind; but this chilliness soon gives way to a feeling of exaltation and well-being, difficult for those who have not experienced it to understand. No intolerable noon-day heat compels a siesta. Their food is bolted and digestion retarded; their gait resembles a run more than a walk; early and

late their minds unceasingly act, and when the nervous force is exhausted, too often alcohol is used to stimulate their flagging energy. At fifty they are old. Such a life is conducive to nervous derangements as well as diseases of the heart. From the fact that women, also, are unusually subject to nervous diseases, it is probable that the climate possesses an idiopathic influence in this direction. The diseases which the physician is most frequently called on to treat are indigestion and derangements of the liver. It is probable that certain acute disease being so entirely absent, these chronic cases assume undue importance; yet they are, to a certain extent, fostered by the climate. Meat, fat, butter, and other heat producers, are used in quantities much greater than would be in a warm climate; the blood is rich to stagnation, and the bilious temperament prevails. In acute diseases the lancet is often absolutely demanded, and though now out of fashion, will eventually be again recognized as a most important therapeutic resource. I will close this article with another quotation from Hippocrates. While his explanation of the frequent association of biliousness with a cool climate may be correct, when he penned the last sentence he evidently did not truly prophesy a prominent characteristic of the typical Californian: "Those cities which are exposed to cool winds during the Summer months and which are sheltered from the hot breezes of the south, possess the following characteristics: As a rule the waters are hard and cool; consequently the men are vigorous and slender, and being of a constipated habit, the fluids of the stomach and liver being abundant, render them bilious rather than phlegmatic. Their heads are hard and the blood vessels unyielding, which renders them liable to burstings. The diseases which are epidemic are pleurisies and other acute lung diseases. There is much suppuration of the lungs, the cause of which is abdominal tension. Dryness and coldness predispose them to rupture of the lung vessels. Those who possess such a constitution must be given to excess of eating rather than drinking: it is not possible to be at the same time a glutton and a drunkard."

## ON THE USE AND ABUSE OF THE MINERAL SPRINGS OF CALIFORNIA.

By JOHN W. ROBERTSON, M.D., Crescent City.

California is rapidly becoming a great sanitarium for the whole world. This is mainly because of her warm and equable temperature, picturesque scenery, and salubrious climate. Although we possess mineral springs in great abundance, and of undoubted therapeutic value, much ignorance prevails, both as to their quantitative analysis and the immediate results that should follow their therapeutical use. People travel to them blindly, seldom consulting even their family physician, imagining that they are "cure-alls," and to be used without discrimination, and in unlimited quantities.

This ignorance is not confined to the laity. Most of our physicians, if consulted regarding the best spring for indigestion, urinary diseases, or rheumatism, could give no intelligent or trustworthy reply. This ignorance is pardonable, for they have received no special instruction upon this subject, nor, were they to seek for sufficient data upon which to base a reply, could anything reliable be found.

In the report of the State Board of Health for 1879-80, there was an able paper by Professor Hatch, in which the location, methods of approach, and chemical composition of many of our springs were discussed.

No attempt has yet been made to so classify the springs that the hard worked physician can readily select and unhesitatingly advise for a definite disease springs which are impregnated with certain medicines. Nor is the time ripe for such an attempt. At least nothing so definite can be said that experience, carefully recorded, is not liable to change. Still, so little has been written on this subject, that a classification of certain springs which are supposed to favorably affect certain diseases is desirable.

Theoretically, springs which are impregnated with magnesia and soda should be laxative and antacid, and probably act well on the liver. Others containing iron should be used for tonics, while hot mud and alkaline springs should affect rheumatism favorably. Experience shows that, while these deductions are, in the main, correct, many trivial causes may so act as to render the waters positively injurious. Experience, combined with theory, should be our guide. Even yet much ignorance prevails as to the quantitative analysis of the majority of the springs. Every month circulars are received purporting to contain exact analyses which prove their resemblance to some celebrated spa. Very often the analyzer is either unnamed or unknown. It is difficult to separate analyses that are reliable from the unreliable. Physicians should understand chemistry, but, as a rule, we do not. Yet we often pronounce with authority as to the ingredients impregnating mineral waters.

Springs are found in such abundance all over this coast that there are few country physicians whose opinion is not asked as to their curative value; ordinarily a bottle of the water is sent in, and on this we must base an opinion. Nothing can be more unreliable than smell and taste, about our

only means of investigation. Unwilling to confess ignorance, a hasty and utterly unreliable opinion is given.

A quantitative analysis is one of the surest tests of a chemist's knowledge and skill in manipulation. The many reagents necessary for the detection of the various chemicals, and the difficulty of separating and weighing them, requires a thoroughly equipped laboratory as well as a chemist skilled in the practical details of the work.

The proprietors of some of the springs have put forward claims so preposterous as to entirely upset the possibility of the correctness of their analyses.

One claimed an appreciable amount of iodide of potash, another medicinal doses of arsenic. While traces of both iodide potash and arsenic have been found in water, there has never been enough held in solution to be of any therapeutic value. A possible exception is Bourboule, in Auvergne. Some have claimed to find as high as  $\frac{1}{2}$  gr. of arsenic to the pint, but other authorities positively deny its presence in such large quantities.

In the report of 1880, there is an analysis of the New Almaden Vichy water in which the amount of sulphate of lime (gypsum) is ten grains to the quart. Water, under the most favorable circumstances (pure 35° Fahr.) will only hold in solution twenty grains of sulphate of lime to the gallon. In the same report the amount of gypsum in the Paso Robles mud spring is given as eighteen grains, an amount not impossible but improbable.

A few analyses by Professors Hilgard, Rising, and Price can be regarded as accurate, but so little confidence was placed in the majority that, at the urgent request of the State Medical Society, a State Analyst has been appointed, whose duty it will be to examine all waters in equal quantities and on one uniform plan. Professor Rising of the State University now fills this position, and, as soon as the necessary funds are procured, an analysis of all springs will be undertaken. Uniformity of procedure being secured, and there being no interested attempt made to prove a resemblance to some other spring, the result will be of great scientific value.

Not only are correct analyses absolutely necessary, but carefully recorded experience must be sought for. To every mineral spring used in the treatment of disease, a physician should be attached and his advice followed, not only as to the amount of water imbibed, but more especially in relation to those various hygienic rules which should govern the habits of life of each individual patient.

Mineral springs are of such frequent occurrence that, unless they are of easy access and surrounded by fine scenery, little attention is paid to them. They are found most abundantly in what I have named the Valley belt, which includes the coast hills and adjacent interior valleys. They occur in groups or irregular lines. Several theories have been advanced as to the origin of mineral springs. They are found in those regions where, together with abundant deposit of ocean salts, there has been recent volcanic action.

California is, geologically speaking, the youngest of the States. America was gradually upheaved from east to west, and this coast did not emerge till the late tertiary period. Therefore, salts are found in great abundance. Volcanic products are met with everywhere, and, while all active manifestations have ceased, the frequent earthquakes remind us that the crust is not yet in a state of equilibrium. These earthquakes cause fissures, through which, the continuity of the water-bearing veins being interrupted, streams well up.

Water, in its pure state, is a powerful solvent, and, when this action is

intensified by the pressure incident to its depth below the surface, it readily dissolves many of the substances contained in the rocks which it permeates. In thermal springs, another powerful factor is added. This heat depends upon the depth of their origin; the hotter they are the more freely do they dissolve and hold in solution certain of the substances contained in the volcanic products and ocean sediments through which they flow. They start deep down beneath the surface and ascend almost perpendicularly. It is possible to approximately calculate their depth. As the average increase is  $1^{\circ}$  for every fifty-three feet of descent, those springs which have a temperature of  $100^{\circ}$  originate two thousand one hundred and twenty feet below the surface,  $150^{\circ}$ , four thousand seven hundred and seventy feet, and so on. This calculation is based on the hypothesis that the temperature at the surface is  $60^{\circ}$ .

This theory is not in accordance with that usually taught in text-books, viz.: that the water is heated by uncooled masses of lava. According to this theory there would have to be a bed of hot lava beneath every spring or group of springs. This might and probably does happen in a few of the boiling springs, but when called on to explain hundreds, it is found as arbitrary and unscientific as was that of geysers before it was overthrown by the brilliant researches of Bunsen.

It is a scientific axiom that natural phenomena should, when possible, be explained by well known laws rather than possibilities. The first theory is, scientifically, simple, and the phenomena follow naturally. According to the second, all springs of a given region should be of the same or nearly the same temperature, and should hold in solution substances contained in the volcanic products. This they do not necessarily do, though very often they are found, owing to the fact that fissures most frequently occur in volcanic countries. The theory that the heat is caused by chemical combustion, though still popular with the laity, is disowned by chemists. This brief summary of the origin of mineral springs, impresses the fact that the substances composing them differ indefinitely, there being no possibility that the minerals found in any two should be identical, or equal in quantity.

As the crust of the earth is impregnated with so many mineral compounds, indiscriminately scattered, it is not to be presumed that any two mineral springs would nearer resemble than that a few glass beads, rolling at random, should form the same kaleidoscopic picture. For this reason it has been found very difficult to so classify the springs as to correctly indicate both their chemical constituents and their therapeutic action.

Neither the German or French classification based on chemistry, nor that of Althaus on therapeutics, nor Walton's, which makes an attempt to combine the two, has been adopted as standard. In using the chemical classification—saline, alkaline, sulphurous, or ferruginous—the mineral and metallic constituents of the spring are liable to be so intermingled, and to differentiate by such infinitesimal shades, that it might be possible to class certain springs under all of these divisions. Or a spring may be very strongly impregnated with salines, and a very minute amount of sulphuretted hydrogen will so saturate the water that it can be classed as sulphurous.

Certain springs containing the sulphates of magnesia and soda are purgative, but they may be so modified by alkalies as to act either on the liver or kidneys. It is thus seen that no exact classification, either chemical or therapeutical, is possible. Nevertheless, it is found expedient to use the chemical constituents as a foundation on which to base a system that

will prove to be a serviceable therapeutic guide. Each spring is a law to itself. While a qualitative analysis will indicate the class of diseases which are most liable to receive benefit, long and carefully recorded experience is the only unerring guide.

Since mineral springs have become so fashionable, and people resort to them indiscriminately—the location and scenery proving a greater attraction than the minerals contained in the springs—it is absolutely necessary that a guidepost should be set up which may turn them in the right direction.

Mineral waters can be prescribed for the following diseases: Neuralgia, chronic rheumatism and gout, skin diseases, scrofula, syphilis, anæmia, chlorosis, dyspepsia, certain conditions of the liver, diabetes, gall stones, gravel, calculus, catarrh of the bladder, chronic bronchitis, and chronic laryngitis.

#### RHEUMATISM.

For rheumatism, more than for all other diseases, do patients resort to mineral springs. Whether or not this state depends on an acid condition of the blood, alkaline waters prove curative. It must be remembered that there are two types of constitution specially prone to take on this disease—the anæmic and the plethoric. It is the latter class which receives most benefit. This is no doubt due to the fact that the alkaline waters and hot baths prove too debilitating to those already enfeebled.

In muscular rheumatism, and in chronic rheumatism affecting the joints, far more benefit is derived from the use of thermal baths than from the internal use of the water. The baths should not be over 105°, nor the time of bathing over fifteen to thirty minutes. The springs for internal use liable to prove beneficial, are: Adams, New Almaden Vichy, Tuscan, Summit Soda, Bartlett, Volcanic Mineral, Witter, and Fulton Wells.

The following thermal springs are also used internally, but are to be more especially recommended for external use: Paso Robles, Skaggs, Agua Caliente, Shovel Creek, Calistoga, Santa Barbara Hot Springs, Ætna, Harbin, Howard, and Gilroy Springs.

#### GOUT.

Those suffering from acute gout should be advised against going to mineral springs, unless they put themselves under the care of an experienced medical man. Trousseau long ago sounded the note of warning, and forcibly set forth the danger of cutting short a paroxysm.

It is useless to go into the etiology and natural history of an attack of gout. Though mineral waters and hot baths will cut short a paroxysm, the danger of involving some vital organ is too great to justify us in advising their use.

Gouty patients can, in the intervals between paroxysms, indulge in the moderate use of the water, but only by the advice and under the immediate supervision of a physician. Those alkaline springs rich in carbonate of soda should be selected, such as the Highland, Geyser Spa, New Almaden Vichy, and California Seltzer Springs.

In chronic gout mineral waters can be used more freely, but still with circumspection, and only in the intervals between paroxysms. Those alkaline waters strongly impregnated with chloride of sodium should be recommended. The most pronounced springs of this type are the Bartlett, Summit Soda, Saratoga, and Tolenas.



## SKIN DISEASES.

Some of our mineral springs have obtained great reputations for their almost specific action on psoriasis and certain chronic, rebellious eczemas. Sulphur waters, and especially those strongly impregnated with salines, have cured when there has been a failure of all other therapeutical resources. They are used internally, but are far more efficacious when applied locally, as baths. When used too strong or too frequently they are liable to produce an irritation or even a subacute inflammation of the skin. Some authorities consider that this is necessary to produce that healthy nutrition of the skin which often follows after their use is moderated or entirely stopped. The springs best adapted to this class of cases are Tuscan, Gilroy, Shovel Creek, Witter, White Sulphur, Agua Caliente, Bartlett, and Fulton Wells.

## SYPHILIS.

No mineral spring is of itself sufficient for the cure of syphilis, though very often they are found most serviceable in assisting the action of the medicines usually prescribed. All physicians know that at times, and for reasons they cannot understand, mercury and iodide of potash fail to relieve, but a few hot baths, whether they are mineral or not, will so affect the system as to render them efficacious. Another and most important service rendered us by hot mineral baths is their use as a diagnostic criterion. Persons whose skins are smooth and without blemish, after using hot baths for a few days, will sometimes find their bodies covered with a well marked syphilitic eruption. In cases of suspected contagion this is a most important means of diagnosis. For this purpose any of the hot sulphur springs can be recommended.

## SCROFULA.

No disease or discrasia is more benefited by mineral water than is scrofula. Strong saline waters should be selected, especial reference being paid to the amount of chloride of sodium they contain. The water is to be used both for baths and internally. The Pacific Congress, Hot Borate, Ætna, Tuscan, Bartlett, Paso Robles, and Calistoga Springs are indicated, and their therapeutical effects will be in the order named.

## ANÆMIA AND CHLOROSIS.

The chalybeate springs are to be prescribed, such as the Pacific Congress, Soda, Bonanza, Litton Seltzer, and Geyser Iron Springs; all of which contain iron in appreciable quantities.

## NEURALGIA.

This disease is often dependent on a depraved, anæmic condition of the system. Whatever builds up the health and invigorates the body will act favorably on the neuralgia. For this reason the chalybeate waters just mentioned are to be recommended. Good results have been claimed from the use of thermal baths.

## CHRONIC BRONCHITIS.

Persons suffering from this disease have been divided into two classes—the lymphatic and the sanguine. For the lymphatic, sulphur waters both



internally and externally are highly recommended. Such springs as the Tuscan, White Sulphur, Witter, and Pearson should be advised.

For those of a sanguine temperament, springs containing carbonic acid, especially those rich in bicarbonates, are indicated. A mild and uniform climate, moderate elevation, and freedom from fogs, are also essential. Above all other springs the Highland comes the nearest fulfilling these requirements. Nature seems to have lavished her gifts in rendering it peculiarly suitable for this particular disease.

#### CHRONIC LARYNGITIS, OR CLERGYMAN'S SORE THROAT,

Is a disease frequently met with on this coast. So rebellious is it to internal medication, and so often does most persistent local treatment result in but temporary improvement, that recourse should be had to those of our mineral springs which experience teaches us acts most beneficially. Alkaline springs, impregnated with chloride of sodium, and sulphur waters rich in soda, act most efficiently. The Geyser Spa, Hot Borate, Ætna, Paso Robles, Calistoga, White Sulphur, Summit Soda, and Volcanic Mineral Springs are to be selected.

#### DYSPEPSIA.

This word covers a multitude of diseases, or rather abnormal conditions of the digestive apparatus.

The secretion of the stomach may be deficient in acidity or overacid; or there may be flatulence, gastralgia, constipation, or hepatic complications. There can be no certain rules laid down to cover all these cases. Much careful consideration is necessary to properly discriminate in the selection of a mineral spring.

Ringer, advocating the use of alkalis for the purpose of increasing the acid secretion of the stomach, directs that they shall be administered just before eating; claiming "that alkalis applied to the orifice of glands with acid secretions increase their secreting power, while alkalis applied in a corresponding way to glands with alkaline secretions lessen or check this secretion."

On the other hand, when there is excessive acidity, the alkaline waters should be used after eating, during the process of digestion.

For *gastralgia* alkaline waters are indicated, but they are only to be used in the interval between the paroxysms of pain. For all of these forms of dyspepsia, alkaline waters, rich in carbonic acid and the bicarbonates, are to be chosen, such as Highland Springs, Napa Soda, Summit Soda, Soda, Litton Seltzer, California Seltzer, and Geyser Spa Springs.

Those who experience a sense of fullness and oppression after eating, and especially where this is associated with *flatulence*, should avoid alkalis and seek those springs rich in salines. Carbonic acid would only add to the discomfort and distension already existing. The saline springs chosen should be those containing chloride of sodium in abundance, such as the Pacific Congress, and Tolenas.

#### RENAL DISEASES.

Like dyspepsia, this term includes diseases occurring in many and protean forms. The function of the kidneys is excretory. They act as a sieve in separating poisonous and useless products from the blood. These products often set up an irritation in some part of the urinary apparatus.

A most frequent example of this is found in patients of a gouty diathesis, whose urine is loaded with lithic acid. This condition is commonly known as lithiasis or gravel. There is nephralgia and more or less irritation of the whole urinary tract. When severe the cooled urine is reddened by an orange colored deposit of lithic acid. Mineral waters act doubly well in these cases, both by correcting the condition of the system causing this, and by its immediate action on the acid condition of the urine. The waters chosen should be those strongly impregnated with alkaline carbonates, such as Ætna, Bartlett, Byron, Tolenas, Soda, and Skaggs Hot Springs.

On the other hand, where there is pronounced alkalinity of the urine with phosphatic deposit, calcic waters should be used. The springs containing carbonate of lime in the greatest abundance are: Highland, Ætna, Summit Soda, Napa Soda, Pacific Congress, and Geyser Spa. As these contain so many of the other alkaline carbonates, we may find by experience that some of them are injurious when used for this phosphatic condition of the urine. Calculi being composed of the solidified deposits of gravel, may be of either acid or phosphatic origin. Therefore, the same directions are to be given as for gravel.

#### DIABETES

Is supposed to be favorably affected by mineral waters containing chlorides, carbonates, and the purgative sulphates. There is no spring on this coast of which there is an authoritative analysis that will satisfactorily fulfill all of these conditions. Could the published analysis of the New Almaden Vichy be relied upon, that spring might be of service. For reasons already explained, this analysis is not trustworthy.

Though some physicians have claimed good results from the use of mineral waters in Bright's disease, the best authorities forbid their use. Beyond all question a change of scenery, climate, and surroundings would have a good effect on this as well as on all other debilitating diseases. This remark is doubly true of consumption. This class of cases, in their fight for life, flock to the springs, and by sweating and purging themselves, are irreparably injured.

This brief summary of diseases, and the springs which are supposed to be most serviceable in their treatment, cannot, for many reasons, be considered unchangeable or final. There is little recorded experience, because patients have pursued no system in their use of mineral water.

Should physicians take this matter properly in hand and judiciously advise their patients, and make report to the proper authorities, it is probable that before the next Report much new information that would be of practical importance would be gained. One source of uncertainty will surely be overcome. Professor Rising is now at work correcting faulty analyses and bringing uniformity out of chaos. When this is accomplished, a foundation will be laid that is absolutely necessary to the pursuance of this work.

## ON THE NECESSITY OF QUARANTINE ALONG OUR SOUTHERN FRONTIER.

By M. F. PRICE, M.D., Colton, Cal., Correspondent of the Board.

As a matter of considerable importance, attention is called to the fact that this part of the State is very liable to be invaded by contagious diseases from foreign countries, particularly Mexico.

The Southern Pacific Railroad has connections at Benson, Arizona, with the Sonora Railroad, which runs to Guaymas, in Sonora, Mexico. Yellow fever is almost indigenous in Sonora, and there is a great deal of travel between the two countries.

Refugees from any epidemic in Sonora naturally seek a way of escape by the Sonora Railroad into Arizona, and thence into California by the Southern Pacific Railroad. Guaymas being on the Gulf of California, is connected by steamers and other vessels with the lower Mexican, Central, and South American ports, as well as the Isthmus of Panama. Vessels also ply between Guaymas and California ports. Passengers arriving at Guaymas, and learning that they might be quarantined at San Diego, Los Angeles, or San Francisco, would be inclined to think they might be able to "slip in by the back door," left unguarded, would leave the vessel, and take the railroad for Arizona, and thence into California unmolested, thus counteracting any good which might have been accomplished by quarantine at the seaports. A quarantine officer at Nogales, on the Sonora Railroad, at the boundary line of Arizona and Mexico, might be able to stop infected persons, but such officer would have to be maintained by the General Government. But, in case of any epidemic in Sonora, there are other means of its introduction here than by the Sonora Railroad. All the Mexican settlements pour their inhabitants into Arizona by stages, teams, etc., and these fleeing persons soon strike the Southern Pacific Railroad at various points, and thus get into this State by the most direct route, and escape the quarantine, if any should be attempted at Nogales. The climate of Sonora, and the insanitary habits of the people, make it peculiarly liable to epidemic disease, particularly yellow fever and Asiatic cholera, and, therefore, it is very necessary for this State, through the State Board of Health, to take steps to prevent their introduction here. The Southern Pacific Railroad is also the direct line of communication from New Orleans and all the gulf ports, as well as Central Mexico. In view of all these facts, it seems to me very important that some provision should be made for an effectual quarantine at some point on this line where it will protect the State from the introduction of contagious diseases. I have been on the line of the Southern Pacific Railroad in Arizona and California for over four years, and have studied the situation thoroughly, and am satisfied that it is an urgent necessity.

Arizona, being a Territory, has no effective quarantine laws, and the railroad a large part of the way runs through a desert and uninhabited country; therefore infected persons and cars meet no obstacle to an easy entrance into this State.

The rational place for a quarantine station is, of course, on the border,

but on this route, I think, this is impracticable. East of this is the Colorado Desert, which extends from the Colorado River, our eastern frontier, to the mountains, and is some one hundred and fifty miles wide at this point. Therefore, the most suitable point would seem to be at the western border of the desert where the railroad enters the San Geronio Pass. Banning is the first settlement and is quite a prosperous community, hence the quarantine station should be east of that, say at the railroad station called Cabezon. At this point I think both wood and water can be had, and it is far enough from the settlements to protect without danger of communicating the diseases.

As already said, I think it quite important that this possible and probable route for the introduction of yellow fever and cholera should be looked after, and means adopted to protect the State, and it is to be hoped that the next Legislature will see that funds are provided for so desirable an object.

## YELLOW FEVER IN CALIFORNIA.

By ALFRED M. PERRY, M.D., San Francisco.

A visitation of yellow fever to the Pacific Coast States would, five years ago, have been considered an impossibility. But, in view of the appearance of yellow fever on the west coast of Mexico in places which have a similar climate to parts of California, this danger is not chimerical. Yellow fever has existed all along the east coast of Mexico and Central America since 1800, but it never once crossed the country until 1882, when it ravaged many of the towns on or near the west coast of Mexico, latitude 23° north, particularly Mazatlan, Guaymas, and Hermosillo, in about latitude 28° north. These places have fancied themselves secure from yellow fever, owing to their peculiar climatic conditions, of dry climate, scanty rainfall, and low night temperatures. Since 1882 the yellow fever has appeared every year at these places, and we may consider from past experience that the disease is and will remain endemic in the west Mexican ports. There is a frequent and increasing commerce both by railroad and sea between these ports and the southern part of California, which must be considered as in some danger during the warm season. According to Blodgett's *Climatology of the United States*, Los Angeles, San Diego, Riverside, and most of the San Joaquin Valley, has a mean Summer temperature of 75° F. This is very near the same Summer temperature as Lisbon, Portugal, and Cadiz and Barcelona, Spain. The other climatic conditions of San Diego are similar to those of southern Spain and Portugal, and yellow fever has ravaged these places several times during this century. The mean Summer temperature of the Mexican Gulf coast of the United States, is 82°, and this is the favorite haunt of the yellow fever. This disease originates at a temperature above 80° F., flourishes at 70° F. and above, below 70° it declines, and cannot be propagated at or below 62° F.

From this relation of the disease to temperature, we see that none of the Pacific Coast ports above Point Conception, latitude 34° N., are in any danger, owing to their low mean Summer temperature of 59° to 62°. Yellow fever has several times been imported, but it has never spread in San Francisco. A quarantine should be maintained every Summer against the seacoast towns of Mexico, and a medical inspection at points where the Mexican railroads enter the State; this duty should be taken up by the State, and a regular annual provision should be made for its maintenance. The quarantine should, however, only be put in force by proclamation of the Governor, on request of the State Board of Health.

## YELLOW FEVER CONSIDERED IN ITS RELATION TO THE STATE OF CALIFORNIA.

By WOLFRED NELSON, C.M., M.D., Member of the College of Physicians and Surgeons  
Province Quebec, Canada, late of Board of Health, State of Panama, South  
America, and Correspondent of State Board of Health, California.

Yellow fever is an acute specific disease, now said to be caused by a special organism or germ. This organism has been recognized, isolated, and cultivated by Dr. Domingo Freire of Rio de Janeiro, Brazil, and Dr. L. Gererd, late Senior Surgeon to the Inter-Oceanic Canal Company, at Panama, South America.

Many years previous to the exhaustive scientific experiments of Drs. Freire and Gererd, Dr. Hassal of Southampton, England, during an outbreak of yellow fever there, discovered in the blood of its victims, in the corpuscles, "a hitherto unknown microscopic vegetation."\*

I am perfectly acquainted with the experiments conducted by Dr. L. Gererd at Panama. They were made during my residence, as a practitioner at Panama, 1880-1885. During a part of the time my brother, the late Dr. George W. Nelson, was Dr. Gererd's Assistant Surgeon at the Canal Hospitals.

An account of Dr. Gererd's methods of cultivating the yellow fever germs, and of his being inoculated, was written by him, for the *Canada Medical Record*, Montreal, and translated by the writer, and published this Fall. Dr. Gererd's experiments, extending over three years, confirmed the views held by many students of this awful disease, and proved conclusively the great resisting power of the germs to destructive causes, illustrating how they may be dormant for long intervals of time, and then spring into new and death-dealing activity. The germs merely require the necessary conditions.

### WHAT ARE THE NECESSARY CONDITIONS?

A temperature of 72° F. and upwards, for a prolonged period. For ordinary surroundings, a moist, swampy soil. Oftentimes an admixture of salt and fresh water. Vegetable and animal substances passing to decay. Of course, in the presence of heat and moisture. In short, all the factors that play an important part in the rapid growth and decay of vegetable life. Add to these the refuse of cities and towns, at sea level; substances wetted by one tide, and left under a burning sun during its ebbing. This makes the list fairly complete. In such localities it is evident that the germs of yellow fever find a congenial soil.

A part of the conditions already given, within as well as without the tropics, produce malaria. The exact role of malaria in yellow fever has not been determined. For one, I am of opinion that the fearful mortality of yellow fever subjects at Panama, and on the isthmus generally, is largely due to the previous effects of malarial poisoning.

\* Cyclopædia of Medicine Ziemssen, Vol. 11, Art. Yellow Fever, Haenisch.

## YELLOW FEVER ON THE ISTHMUS OF PANAMA.

I have seen yellow fever on both sides of the isthmus. My knowledge of it, may be stated thus:

Yellow fever is an acute infectious disease, ordinarily not contagious, but, under certain atmospheric conditions, not yet explained, the disease undoubtedly develops contagious properties and epidemics result.

The disease is ushered in, in a variety of ways. It may be preceded by languor or malaise. Generally it was characterized by a chill, often very severe, lasting from one to two and three hours. The length of the chill having a marked significance; severe chills marking nearly all the fatal cases. The reader will please remember that I am detailing my own experience, compiled from voluminous notes, and five years close study of the disease. Again, the disease may be ushered in by sudden nausea and faintness, without any warning, as in my own case, during the isthmian epidemic of 1880. Headache is always met with; generally well marked frontal headache. Frontal headache and gastric irritability in newcomers, as pointed out by Dr. Chas. Belot of Havana, is very suspicious. The headache may be occipito-frontal. A history of constipation obtains in all cases. I can recall but a single exception, that of a case where fever was preceded by a tropical diarrhœa. No condition of health gives immunity. Pains in the legs, and pain in the sacrum; the latter intense and agonizing. I shall never forget my own experience. It seemed as if a legion of fiends were trying to dig out my sacrum with hot pincers. The pain is excruciating and indescribable. In the majority of cases the patient's face was red, just like the face in scarlet fever, the boiled lobster color. The eyes at first were clear, providing that there had been no antecedent hepatic disease. Later they became suffused, injected. The skin was hot and dry; in many cases a peculiar biting heat was felt. It was strange, causing a tingling in the hand, as if a current of electricity was playing over it. Pulse full, hard, and slow, varying from 65° to 80°; temperature, first stage, 100° to 103°, where the cases proved fatal in the first stage rising to 104° to 106°, to fall slightly just before death. In the second stage, or "period of calm," as it is called, it fell, a remission only. At the beginning of the third stage, or the stage of "secondary fever," it runs up again. Respiration during the fever is hurried; at times a peculiar moaning respiration. The respirations varied from thirty to forty per minute, at the close of the third stage fifty to sixty, becoming less with the fall of temperature, just before death. Great thirst. Restlessness, no position giving any ease. Urine, at invasion, normal, but high colored. In the majority of cases at Panama they died during the first stage, when all or nearly all the symptoms detailed and to be detailed, appeared. They do not appear in any stated order.

Within twenty-four hours after invasion, all the symptoms were intensified, sacral pain and headache increasing. Epigastric uneasiness and tenderness developing early in many cases; the slightest pressure on the stomach causing intense pain; next, nausea and vomiting; at the first, clear—well named "white vomit" by Surgeon-General Blair, of British Guinea, South America; tongue at first slightly coated. In patients who had suffered from intermittent or bilious remittent fever, the characteristic tongue was not so well marked. It may be clean or slightly furred at base; later, fur increases from behind forwards; the tip and edges take on a deep red, and towards its close a fiery red; gums also get red, also mucous membrane of the mouth; the whole mucous tract suffers; later,

in many cases, sore throat is complained of, due to stripping of the mucous membranes; often blood oozes from the denuded tongue and gums, giving an indescribable fetor to the breath; occasionally a peculiar and characteristic odor is met with, exhaled by the patient's body; it never will be forgotten; it is a very bad omen. Dr. Stone, of Louisiana, first pointed it out. Where patients die in the first stage, the urine always shows a large amount of albumen; in some cases it does not appear until the close of the second, or beginning of the third stage. Albumen is a *sine qua non* in yellow fever. Many authors assert that it is pathognomonic. It never was absent in isthmian cases: suppression of urine is a late and fatal symptom. The bowels, if acted on freely by the sulphate of soda, to be referred to, may not furnish any information; diarrhoeal motions are followed by "black vomit motions" in many fatal cases. The motions may precede or follow "black vomit;" there is no fixed rule. Black vomit follows the constant retching and "white vomit" of Blair. Black vomit is happily named, and shows innumerable fine particles of flocculi; hence its name "black vomit," or "coffee ground vomit." Frequently patients are seized with it without any warning; it spurts through the mouth and nostrils; again, the patient may be quietly resting on his back after the subsidence of the sacral pain, when the "black vomit" spurts from his mouth up into the air over everything, *per saltem*, as an old writer has described it.

Black vomit has a peculiar acid odor, is slightly acid to the taste. I did not have "black vomit" during my case, but to clear up a vexed point in my mind, I tried several mouthfuls of it. It will hardly become an article of diet. The vomit on settling deposits its "coffee ground" particles, the fluid above being of the color of diluted black tea. "Black vomit" is not bilious vomit, an important point to clear up in many cases of true bilious-remittent fever. Black vomit, as a symptom, is one of grave import; nearly all die who have it. During an epidemic in Lisbon, many recoveries were reported among total abstainers who had had it. Being total abstainers undoubtedly has saved hundreds of lives. The past asserts it, and the present proves it. Again I speak from my experience. I can recall several cases that were deemed hopeless, where the patients got well, but they had been practically, total abstainers. Isthmian and Brazilian experience proves conclusively that moderate drinkers are among the first victims. Such are the facts.

Here I must branch off, and state that two classes of cases are met with on the isthmus; cases that I took the liberty of terming "uncomplicated" and "complicated." By "uncomplicated," I mean the disease occurring in a new arrival. In these, brain symptoms and delirium, etc., were common. The "complicated" cases occurred in those who had been on the isthmus for six months to several years, and in one case sixteen years, and were full of malaria.

Regarding the coloration of the skin; the yellow tinge from which the disease derives its name, may or may not be present during life. If so, the eyes show the jaundicing first. The color generally is met with during convalescence, and post-mortem. It may be shown in\* cases in their early stages, by making firm pressure with the hand over the chest or abdomen, and then removing it suddenly. The imprint of the hand will be found mapped out in a rich canary yellow, while the adjacent parts have a dull mahogany color. The icteroid condition is there, and the temporary suspension of circulation in the capillaries show it. Quite by accident, I

\* Cyclopaedia Pr. Med., Ziemssen, vol. 11.



noticed this condition in an early case, and afterwards used it for diagnostic purposes.

Next to the second stage or "period of calm," as it is termed, there is a marked fall of temperature, a true remission. The patients feel almost well. I can illustrate this: In two such cases, both mine, the patients (husband and wife), new arrivals, just married, in direct violation of my orders, got up and left their beds and walked about. In the woman's case the secondary fever came on that night—a vaginal hemorrhage—she died the next morning at four. His temperature ran up to 106°—he died two days later.

Again, I must diverge, and state that the true yellow may be a disease of a single access or paroxysm. When it is so, the patient dies, or enters on convalescence after a single access of fever. In the great majority of cases, "the period of calm" is deceptive, the remission in the symptoms lasting twenty-four to thirty-six hours to merge into the third stage, or that of "secondary fever," when albumen, black vomit, etc., appear. In cases ending fatally in this stage, all the symptoms crowd each other, and death closes the scene.

In cases complicated by delirium, painful scenes result. I can recall one: A healthy young Englishman was stricken down on landing; his case closed with furious delirium. Four strong men had to hold him down. They are dreadful scenes, and never to be forgotten.

Such is my experience of yellow fever at Panama. Yellow fever must be seen and studied in its own habitat to fully impress a professional man. I have seen the disease aloft. It gets into the shipping at Panama, cutting off a victim from time to time. I recall several cases, where passengers north and south, via the isthmus, got the germs of the disease and died en route; this remark applies equally to the Atlantic and Pacific Oceans.

#### POST-MORTEM APPEARANCES.

My small experience under this heading simply confirms what an old writer has said, Dr. Greenville Dowell, that yellow fever has no pathology. The appearances are so variable in patients cut off by the same symptoms that no reliance can be placed on them.

*The Liver.*—This organ differs, presenting a variety of conditions. I have found it fatty and oily, again seemingly normal in size and color, again mottled. The chamois colored liver is supposed to be the yellow fever liver. I saw but one; in the practice of a friend.

*The Kidneys.*—They vary, nothing constant. I met them large and small, looking normal.

*The Stomach.*—This organ presented signs of acute inflammation. Generally its coats were thickened. It contained more or less "black vomit," its internal surface showing innumerable pink points or foci of congestion, and small deposits of blood. Dr. Castellanos, a Spanish practitioner at Panama, and formerly an hospital surgeon in Cuba, told me that it was the only constant condition found by him, and he had made over one hundred autopsies while there.

*The Blood.*—I found in fluid condition. Its specific gravity, taken by me two hours after death, was almost normal. To this fluid we must look for important information.

*Bladder.*—Two or three drachms of highly albuminous urine may be found in the bladder.

*Rigor Mortis.*—This sets in at once and is marked.

*Color of Skin.*—The rich canary yellow of the skin, at times contrasts with a rich purple mottling.

*Increased Temperature.*—*Post-mortem.*—How are we to account for the increased temperature of yellow fever cadavers? What is the condition that then obtains, and would constitute fever during life? During this month (August) it was my good fortune to meet Dr. A. J. Reese, of Mobile. The germ diseases were discussed *in extenso*. Is this post-mortem heat due, as he suggests, to the role of the microbes still feeding on the "host," or infected body?

Personally, I am of opinion that in the near future pathologists will find the cause of death, in the blood, a true necræmia. If this view, which I believe is peculiar to myself, be proven, we have an explanation of the majority of symptoms of specific yellow fever. Much remains to be unfolded about yellow fever. Many patient toilers are working at the problem, and a solution may be reached when least expected.

#### TREATMENT.

Here I take the liberty of stating that yellow fever has no treatment, properly so called. Four centuries of the disease have taught us nothing, or rather people have failed to learn. To-day no one, or any combination of remedial agents, exerts any influence on the disease. The various text-books that I am familiar with, in English, French, and Spanish, refer to remedies by the dozens, a practical acknowledgment that the disease has no treatment, properly so called. It is purely symptomatic.

After trying many medicines, and seeing my patients die, with an occasional recovery, due to the patient's previous condition rather than to any skill on my part, I settled down on a line of treatment, so called, as follows: On being called to see a patient, say at the outset, I played a trump card and made quinine the diagnostic agent. Pray remember that a few hours in such cases, be they pernicious fever or yellow fever, may mean a life, pernicious fever killing in from twenty-four to thirty-six hours. If pernicious, the quinine was a specific remedy. My prescription was as follows:

B. Quin. sulph.,  $\mathfrak{z}$ i.  
Acid. sul. dil. B. P.,  $\mathfrak{z}$ ii.  
Sodæ sulph.,  $\mathfrak{z}$ ii.  
Tinct. Cardam co. of B. P.,  $\mathfrak{z}$ ii.  
Aq. ad.,  $\mathfrak{z}$ viii.  
Misce. Fiat mistura.

Signatur.—Take a quarter at once and repeat in two or three hours. W. N.

This remedy was given diluted with water. It made a perfect solution and was readily absorbed. Its rejection by the stomach was the exception to the rule. It was my "multicharge gun"—it gave me the best results.

If the case was purely malarial, the quinine and saline met it. The sulphate of soda acts like a charm, free bilious motions following. Every dose contained fifteen grains of quinine and half an ounce of sulphate of soda. If after two doses the temperature remained high, 100° and upwards, with the other symptoms, yellow fever was the verdict. Very valuable time had been saved and the bowels freely opened, a most important indication.

I may remark that bilious remittent fever and intermittent and the fever of acclimation, so called, may cause doubts at the very outset, but

quinine meets the first and second, and the third has not the characteristic symptoms of true yellow fever.

Next, to bring about free action of the hot and dry skin. At first I tried hot baths, and later nitrate of pilocarpine, and abandoned both, using instead a vapor bath, called in Peru "Dr. Wilson's treatment," being that of an English physician, who used it with success during an epidemic there in 1854 and later. The patient was placed on a chair with a wooden seat, all clothing being removed previously; he was then covered with blankets, that were closely tucked in under the chin; a spirit lamp was then lit and placed under the chair. To this I added a foot bath, all under the blankets, the water as hot as the patient could bear it. Finally I grafted on some Jamaican treatment, and gave a pint of hot lemonade. Under this combination a profuse perspiration followed, usually within ten minutes; it fairly ran off them. As soon as it was freely established they felt better at once; the scarlet color of the face was less and the pulse was softer. If the bath caused faintness, that was guarded against by a shorter exposure. The patient then stood up, the chair was slipped from below the blankets, and he was lifted to bed, *en masse*, to prevent escape of heat or moisture. More blankets were put over him. In many cases the free perspiration lasted for one or two hours, to the marked relief of the patient and the lessening of the symptoms. If at the expiration of that time the skin again grew hot and dry, the same measures were repeated, half a dozen times if necessary. Thus two important indications were met at the very outset—first, free motions from the bowels (remember the previous constipation); secondly, full and free action of the skin. According to my way of thinking, the patient was placed under the most favorable conditions for fighting the disease. Then the rest of the treatment was in order—sinapisms directly over the stomach, for vomiting. At times they were beneficial, at times wholly useless. For diet, iced milk: beef soup, without fat; cool acid drinks, such as lemonade, in very small quantities (the stomach had to be watched); aerated waters: small pieces of ice in the mouth.

The symptoms must be treated as they declare themselves. Some recommend iced champagne. I gave it a fair trial and abandoned it, plain soda water answering the purpose. Despite care and watching the majority died, with an occasional exception. I can recall twenty-seven admissions to the Canal Hospital with but one recovery, and out of forty-two cases sent to the Charity Hospital not a single recovery. I have known the ice-pack to give great relief; in one case that I saw, in consultation in Colon, in 1880, with Dr. Williamson, I suggested and used it. The temperature after two hours' application of ice-cold cloths fell two degrees, and the patient recovered after black vomit, but he was a young man of excellent habits with a robust constitution. In another case that I saw in consultation, where the temperature ran up to 106° and the patient was delirious, the same ice-cold cloths reduced it to 104½°, when the patient recovered his reason, to lose it again when the temperature reached 106°. He died. He was the late Dr. Allan, Port Surgeon to the Pacific Mail Steamship Company at Panama. His successor also contracted the disease, was given up, but recovered.

The application of cold to the head also gave some relief. Such was my handling of cases. The milder cases got well; occasionally a very bad case pulled through.

## TREATMENT DURING CONVALESCENCE.

Great care had to be exercised, owing to the extreme irritability of the stomach. A meal of solid food has been known to cause death on the tenth day. Slops are in order. Extreme care, bathing, and thorough disinfection of the patient's effects and room.

## DURATION OF THE DISEASE.

The majority of the cases were fatal on or before the fifth day, closing with "black vomit," suppression of urine, etc. In them it was a fever of a single access or paroxysm. Other cases passed through the "period of calm" and died in the third stage, from the sixth to the ninth day. Cases of a typhoid character were rare; they lasted fifteen to twenty days, generally terminating in recovery.

## SEQUELÆ.

Boils, pimples, parotid swellings and suppuration, intermittent fever; the jaundiced skin lasting for weeks. I was of a rich canary color for a month, truly a sight to behold. People never were curious about it; they got out of the way.

## THE FUTURE OF YELLOW FEVER.

Now that Drs. Freire and Gererd have discovered the germ, named by Dr. Freire the *micrococcus zanthogenicus*, let us hope that a new era is at hand, and that the sway of yellow fever is over. The gentlemen named have conferred on the age a discovery of the utmost importance; one that will protect man against this most fatal disease. It may be the lot of some happy individual to discover some remedy that will kill the germ in its habitat, the blood. With inoculations to protect and prevent, and a specific to kill the germ where it has invaded the system, with such agents our profession can save the lives of hundreds of thousands. We want a remedial agent or a germicide for yellow fever; I like the term and make no apology for using it. Intermitents and bilious remittents have a specific in quinine. That a solution of this kind will be found there can be no doubt. Pathologists and microscopists are working. Intermittent fever has its *bacillus malarie*, quinine is its germicide. When that time comes travel within the tropics will be divested of its terrors, and the commerce of nations will be free and untrammelled.

## HISTORY OF YELLOW FEVER.

By early writers yellow fever has been traced back, by some to the sixteenth, and others to the seventeenth century. One claiming that it first appeared in Barbadoes; another refers to the time of Columbus, and affirms that when he landed in the West Indies, in 1493, in the Island of Santa Domingo, he lost the greater part of his crew within a year of the arrival, of a disease described "as yellow as saffron."\*

The West Indies are looked upon as its home. Haenisch says: "The Antilles are the habitat of yellow fever, and in them it may be said to be endemic."†

\* Quain's Dictionary of Medicine, 1885.

† Cyclopedia of the Prac. of Med., Ziemssen, vol. 11.

"It appeared in the Darien," now called the Isthmus of Panama, "in 1514." \*

The disease has been taken to England twice, to spread and cause great dismay. First, by the Royal Mail Steamers from St. Thomas, Danish West Indies, to Southampton, "in November, 1852, they had one hundred and twenty-four cases en route, with a mortality of fifty. Proportion, 1 in 2.3." †

Next, the disease appeared at Swansea, in Wales. "On the ninth of September, 1865, the 'Hecla,' bark, laden with copper, returned from Cuba to Swansea with one case of yellow fever on board; three having proved fatal on the voyage home; the remaining case, that of James Saunders, and two convalescents, were sent on shore. Soon, also, the crew had left the ship and distributed themselves over the town, and two passengers with their luggage were landed. Moreover, a good many people boarded the vessel as she entered the dock. An outbreak of yellow fever thus originated ashore, and in a well drawn up table of the cases, Dr. Buchanan shows their invariable connection with the source of the malady, or indirectly, adding further proof of its infectious nature, should such be required." ‡

Thus there were two outbreaks in England late in the season, one in September and the other in November. Since 1761 the Island of Cuba has suffered severely from yellow fever. The City of Havana is one of its hotbeds, just like the City of Panama.

Vera Cruz, Mexico, is credited with the disease from time immemorial.§ In Brazil, at Rio de Janeiro, it is endemic, and occasionally epidemic, killing hundreds. It has appeared in Venezuela: in British Guinea repeatedly; Ecuador on the Pacific; in Nicaragua, Costa Rica, Guatemala, 1852 and 1853; San Salvador, Spanish Honduras, and Mexico; in nearly all the islands of the West Indies. It has been epidemic at St. Nazaire, France, Lisbon, Portugal, Spain, Gibraltar, Senegal, Africa, etc.

Last year, 1885, it was epidemic on the Isthmus of Tehuantepec, Mexico.

#### YELLOW FEVER IN THE UNITED STATES OF AMERICA.

Now let us consider what it has done in the United States of America. The map in Dowell's work on Yellow Fever and Malarial Diseases, Philadelphia, 1876, shows how yellow fever has traveled in the United States. Since 1668, it has invaded the following States: Louisiana, Mississippi, Arkansas, Indian Territory, Tennessee, Alabama, Georgia, Florida, North and South Carolina, Virginia and West Virginia, Kentucky, Missouri, Indiana, Maryland, Pennsylvania, Delaware, Connecticut, New Jersey, New York, Massachusetts, Vermont, New Hampshire, and Maine. I may add that it has reached Canada.§ The text with Dr. Dowell's map states: "It will be seen that yellow fever has spread to two hundred and twenty-eight cities and towns in twenty-eight States, appearing seven hundred and forty-one times, causing sixty-five thousand three hundred and eleven deaths (up to 1876, when Dowell's work issued). In nineteen out of twenty cases it was introduced." Dowell adds, "yellow fever, like cholera, leaves its habitat and travels."

\* Report National Board of Health, Washington, 1879.

† *Lancet*, April, 1853, quoted in Dowell's work.

‡ Quain's Dictionary of Medicine, 1885.

§ Yellow Fever, Dr. Gazzo, Louisiana.

La Roche, in his remarkable work,\* describes the epidemics of New York, Philadelphia, Boston, New Orleans, Charleston, Providence, and Mobile.

Dr. Haenisch states: "The yellow fever has never yet been observed on a ship, which has not in some way come into contact with the land, or with some other ship where the disease already prevailed."† Again, he says: "Yellow fever is most probably produced by a living miasm, which has hitherto entirely eluded microscopic demonstration, but the existence of which is argued from many facts. \* \* \* But its seeds long retain their poisonous nature: they are, under certain external circumstances, quite indestructible, and when placed in suitable external conditions are capable of kindling an epidemic even far away from their place of origin."

The disease is spoken of, by the same able writer, as a "specific poisoning in the blood. \* \* \* In any event, yellow fever belongs among the most destructive diseases." "The prophylactic measures which serve for protection against yellow fever must be administered by the State \* \* \* and then there is always the possibility of conveying the poison by land from an infected port to one hitherto free, by means of goods sent by rail, or by means of the personal effects of men \* \* \* and there need be no question that important protection is to be gained by wise quarantine regulations."‡

The value of quarantine is fitly illustrated by the following from the *Telegram*, of Mobile, of date August 21, 1886: "During the present month some six or eight ships have arrived at Ship Island quarantine station, which either contained members of the crew sick with yellow fever, or had lost men on the passage from Colon by that disease. By carefully isolating the quarantine station from the main land, and keeping all communications closed, the physician in charge has prevented any spread of the disease. These cases were undoubtedly yellow fever of a virulent type, the type of the Isthmus of Panama, and the confinement of the disease to the station is one more evidence of the benefits of a strict quarantine, remote from crowded communities. Had these ships been allowed to come up the Mississippi to New Orleans, there is every reason to believe that ere this, with so many cases of possible sources of contagion, an epidemic would have been developed. As it is, New Orleans and the entire coast is enjoying excellent health, and the yellow fever at quarantine is disappearing gradually with the convalescence of the patients."

#### REGARDING ELEVATION IN YELLOW FEVER.

It has been stated that yellow fever in the southern United States, never has been observed above six hundred feet. This experience seems to be peculiar to them. In Jamaica, it was observed in the Blue Mountains at an elevation of three thousand feet. During the Mexican epidemic—west coast of 1883—it reached Colima, fully two thousand feet above sea level. During an epidemic in Peru, it reached Arequipa, seven thousand feet above sea level, and again at Cuzco, Peru, eleven thousand three hundred and seventy-eight feet above sea level, there to commit fearful havoc, and finally it got into the highest elevations of the Andes, fourteen thousand feet above sea level.‡

The above upsets all previous statements regarding the climbing power

\* La Roche, *Yellow Fever*, Philadelphia, 1855.

† *Cyclopaedia of Medicine*, Ziemssen, vol. 11.

‡ Quain's *Dictionary of Medicine*, 1885.

of yellow fever, and shows conclusively that knowledge regarding yellow fever is yet in its infancy.

#### THE PRESENT TENDENCY TO EPIDEMICS.

What significance has the present tendency of disease to take on epidemic character? This seems to be the question of the hour, both in the Old World and in the New, the whole being emphasized by the fact that cholera has started on a grand tour. Truly "coming events cast their shadows before." In the Island of St. Thomas, D. W. I., smallpox preceded cholera in 1867-68. In Hayti, in 1883, a severe epidemic of smallpox merged into one of yellow fever.

Last year smallpox committed fearful havoc in the City of Montreal. True, it was among the unvaccinated French Canadians, but the conditions necessary for an epidemic were there. Remember, that one epidemic predisposes to another; or to be more accurate, the atmospheric conditions necessary for one disease, extends a welcome to another.

This year note the outbreak of smallpox in Iowa, a malignant type of the disease. It has appeared in the Gulf of St. Lawrence, in the French Island of St. Pierre. Again, smallpox was raging in Santiago de Cuba in July of this year. Recent advices show its presence in the Island of Jamaica. Many cases and many deaths. More cholera in Tonquin. In Italy, Austria, Hungary, China, and the Corea. The role played by cholera during the past three years is familiar to all close readers. Its march is onward. The epidemic tendency or "pandemic wave," as it is termed, should cause all to think, particularly those in power, who are intrusted with the welfare and safety of the people.

The epidemic of yellow fever at Panama, in April, May, and June of 1886, with a new outbreak of yellow fever on the west coast of Mexico, Gulf of California, in July, that has made Guaymas, Mexico, quarantine against the gulf ports, furnishes food for thought. Some authors write learnedly of cosmo-telluric influences, using words not intelligible to themselves, to people who know less. Filth and the neglect of cities are largely to blame for the successful march of disease. Given, the necessary atmospheric conditions, in times of epidemic, clean cities and towns are scarcely touched.

#### HOW DOES YELLOW FEVER SPREAD?

By a direct introduction of its specific poison or germs. The ablest writers state that cholera never has appeared in any place until after the appearance of an infected individual or merchandise. The same argument can be applied to yellow fever. From its cradle, in the West Indies, it was taken to the Isthmus of Panama. There, meeting the necessary conditions, it has become a part and parcel of the isthmus. From Panama it spread up and down the west coast of South and Central America and Mexico, and now is permanently established at the very threshold of California.

Now to make an application of the statements and facts already given. The Republic of Mexico joins California, about twenty miles beyond San Diego. The boundary line passes from that point the Yuma, in Arizona. About midway between San Diego and Yuma it passes within twenty miles of the head of the Gulf of California. Lower California is a vast peninsula. Geographically it should be a part of California. The City of Guaymas, in the State of Sonora, Mexico, is connected by the Sonora Railway with Nogales, Arizona. Practically the Sonora Railway is part of the Southern

Pacific Railway. The time from San Francisco, California, to Guaymas, is about fifty hours by rail. From Guaymas to the hot plains of Arizona but a few hours.

The City of Mazatlan, the headquarters of the disease on the Gulf of California, is but six days from San Francisco by steamer. Two lines of steamers place it in direct communication with San Francisco. San Francisco, likewise, is in direct communication with Panama, and the whole coast of Central America and Mexico. Small coasters, steam and sail, ply between the Mexican ports on the main land and the peninsula, or Lower California, the City of Guaymas being a receiving and distributing point for passengers and freight to and from the United States. Having shown the direct communication between Mexico and California, let us consider

#### THE MEXICAN EPIDEMIC OF EIGHTEEN HUNDRED AND EIGHTY-THREE.

The Mexican authorities laid the blame on the Pacific Mail Steamship Company, and dated the epidemic from the landing of the body of Purser Wafer, who died en route from Panama. The authorities were wrong in this. That the disease originally came from Panama is historic, *but for several years previous to 1883, sporadic cases of yellow fever had appeared from time to time. No precautions were taken—absolutely none. In August, 1883, the filth and necessary atmospheric conditions being present, and the sine qua non of all epidemics—food—in the shape of an unacclimated people and new arrivals, there was a grand explosion of the disease.*

The Peralta Opera Company had just landed. Peralta, the prima donna, and seventeen members died in the Hotel Iturbide in Mazatlan. The epidemic there lasted from August to December, killing fully five hundred. When the disease first appeared, Mazatlan had an estimated population of fifteen thousand. Thousands left for the mountains of the interior. The epidemic over, many returned to contract the disease and die. The experience of the medical men in Mazatlan was identical with that of physicians at Panama, and showed that natives from the lofty mountains of the interior were swept away like "chaff before the wind." A scientific expedition en route from the City of Mexico—elevation eight thousand feet above sea level—was cut off in Mazatlan, but one or two escaping.

I spent three weeks in Mazatlan in June and July last year, and learned that after the epidemic of 1883, and the reappearance of the disease in 1884, that no attempts were made to disinfect bedding or apartments. An American, Mr. Dowe, of San Francisco, chaffed me about having the apartments in the Iturbide where Peralta died, and I replied by saying that I had taken all the upper degrees in yellow fever at Panama. His room was near mine, and within a week he was down with it. All the hotels used as such in 1883, 1884, and 1885 are infected buildings. In July and August, 1885, it killed many in Mazatlan.\*

From Mazatlan it spread inland and upland to Rosario, a mining town seventy miles inland, killing many and leaving the disease endemic. A death had been caused by it just previous to my visit in July, 1885.

There is not the slightest doubt in my mind regarding the endemicity of this disease along the west coast of Mexico and many inland towns. Pray note that the disease reached Rosario by stage, taken by fleeing individuals. *It is not necessary that they should be infected; they are carriers.* Another illustration that the germ must be introduced.

While the epidemic was doing its work at Mazatlan and inland, the

\* El Diario de la Tarde, Mazatlan, July and August, 1885.



small steamers in the gulf made their usual trips. Late in August the steamship "Newbern" landed a lot of passengers from Mazatlan at La Paz, Lower California. Seemingly they were in excellent health, but soon after one of them sickened at an hotel in La Paz. The proprietor became alarmed and had him removed. The man died. In a few days new cases were reported, and almost at once it was epidemic. There was a grand explosion of the disease. La Paz has a mixed population of some two thousand. The village padre, or priest, told me that at one time during the height of the epidemic fully one thousand people were down. La Paz is a very hot place, but is well supplied with good drinking water. It is built on a sand bank on the edge of the gulf. Owing to its favorable position, only seventy-one died.

Again a steamer figures. She cleared from La Paz for Guaymas, where the disease soon appeared. Guaymas is almost a land-locked port. There many fell victims to it. Many Americans were swept away. A number of cases appeared in 1884. From Guaymas it was taken inland by the Sonora Railway to Hermosillo, where it became epidemic. Many Mexicans fled to Arizona. My brother, the late Dr. George W. Nelson, was in Tucson in 1884, and while there learned that several cases had reached it from Mexico. This chronicles an important fact—the invasion of Arizona by the disease. Very fortunately the disease did not spread.

A few words about Guaymas. It is a small city, very hot and without drainage. It stands at the end of a long arm of the sea. Its harbor, practically, is land-locked, and there can be but little change in its waters. Old-time privies poison the soil. The bay receives the filth of the houses. I also consider it an infected locality for the reasons already adduced. Further, owing to its peculiar position, it may become a second Havana, both as to the importance of its trade and its yellow fever. I make this forecast and will leave the proof to time.

While in La Paz, Lower California, I received valuable information about the epidemic of 1883, and a case in 1884, from Mr. Viosco, the United States Consul. In Guaymas, Dr. Figueroa, the Health Officer, gave me valuable information regarding its invasion of that city in 1883, and of several cases in 1884. The greatest mortality was among foreigners. Last August (1885) yellow fever again appeared in Guaymas, a fact duly communicated by United States Consul Williard to the Board of Health of the State of California. Last Summer, during June and July, I visited all of the principal ports on the west coast of Mexico, being those of San Blas, Manzanillo, Acapulco off Tonalá, and San Benito; to these must be added Mazatlan, La Paz, Lower California, and Guaymas, on the main land.

Yellow fever reached San Blas, the first port south of Mazatlan, by schooner, vessel carrying fleeing people from Mazatlan; a case appeared, then the usual explosion took place, and the disease was epidemic. The first case appeared September twenty-third; the epidemic lasted until November. I traced its history with care.

San Blas is built on a narrow neck of sand. It has the sea in front and lagoons nearly all around it. The vegetation is rank and luxuriant. The place is low, very hot, and notoriously unhealthy. During the epidemic of 1883, the sick were deserted by their relatives, and were left to die. Bodies remained unburied for days together. A reign of terror seized on its unfortunate people, the majority fleeing for very life to the interior. Disinfection is unknown. It goes without saying that the yellow fever poison is there "to stay." Give it food—newcomers—and it will be faithful to its traditions.

The next port to the south is Manzanillo, whose reputation as a pestilential center surpasses that of San Blas. The town faces the sea; back of it is an immense lagoon covering many miles. During the dry season its waters evaporate and leave it nearly dry. After a full dose of quinine, I visited it at noon. A cloud of vapor arose from its surface; a hot and sickening odor. Vessels many miles off that port have had its vapors reach them, causing sickness among the crew. Yellow fever swept it in 1883. From Manzanillo the disease swept or spread inland and upland, reaching the City of Colima, on a lofty tableland. Colima, for several centuries previously, had a historic reputation for healthfulness. It was considered the spot *par excellence* on this continent for consumptives. Yellow fever became epidemic, killing many and sweeping away its reputation for health. We certainly are learning what yellow fever can do, and old theories must give way to facts.

The epidemic gave the commerce of Mazatlan a blow that it still suffers from. Many residents left it to settle in the interior. While in Mazatlan an extraordinary piece of information was given me. Just previous to the outbreak of 1883, the Chief of the Board of Health left for California for a holiday; he signed a lot of clean bills of health and left them to his *locum tenens*. The epidemic declared itself, and yet the clean bills of health were duly supplied to the outward steamers. This is a fact. I know the physician who signed them, but in justice to him, I must say there was no yellow fever when he left.

This communication deals with facts; useless theories have no place in it. It is a record of personal observations in part, and of facts collected from wholly reliable people, in the centers named. The whole collected under circumstances that to me seemed favorable for the acquisition of such knowledge and information. It is cheerfully placed at the disposal of the Board of Health of the State of California as a record of six years study of the disease and its history.

To repeat, I have dwelt at great length on the condition of affairs on the west coast of Mexico, it being the immediate neighbor of California. *The yellow fever poison is a standing menace to Arizona and California. The west coast of Mexico is permanently infected.* How can it be otherwise while infected hotels receive travelers, and all sanitary precautions are unknown, save in name? To illustrate this: as soon as Mr. Dowe was convalescent, I strongly urged the then proprietor of the Hotel Iturbide in Mazatlan, to thoroughly disinfect the bedding and apartment occupied by Mr. Dowe. He listened to all that I had to say, and, of course, did nothing. Nobody expects an infectious disease to die out under such treatment. If the Mexican authorities enact no laws, what will careless individuals do? Nothing; particularly in a Spanish-speaking center. A criminal responsibility should be fixed on such governments and individuals. An International Board of Health or Congress may handle the subject. Meantime ports, cities, and individuals are sacrificed to man's carelessness and love of gain. To-day Mazatlan and Panama produce and distribute yellow fever.

#### YELLOW FEVER HAS REACHED THE CITY OF SAN FRANCISCO.

*Le Courrier de San Francisco*, in 1883 or 1884 (I have the cutting somewhere), published an account of a jury sitting on a body in that city. While taking the evidence, it was shown that the dead man and another sick passenger had been landed by a steamer from Mexico, and that the corpse before them was that of a victim of yellow fever. *Le Courrier* graphically described how that jury retired. It was a regular *saufé qui*

peut, or rush. I simply cite this to show that the security that San Francisco is supposed to have is fancied rather than real. Steamship owners, and passengers anxious to get on shore, will deceive quarantine authorities. I have shown that yellow fever landed in England and Wales under like circumstances led to a circumscribed epidemic, in the cool of the year, September once, and November, later. Yellow fever is a portable disease, in the broadest sense of the word.

#### YELLOW FEVER ON THE ISTHMUS OF PANAMA.

The Isthmus of Panama deserves special attention, as being in direct communication with San Francisco. The isthmus, truly, is an ancient hotbed of the disease, as it dates back to 1514.\*

In the books of the Foreign Cemetery, kept at the British Consulate, at Panama, and for whose use I am indebted to Claude C. Mallar, Esq., H. B. M. Consul, I found the first record in English of a case of fever, thus: That of a Mr. Lemesurier, one of the Secretaries of Mr. Dawkins' Commission to the Panama Congress of 1826. Cause of death was put down as, "Fever of the country; died June fourteenth." On the fourteenth of July, 1826, or just one month later, Mr. Childers, another Secretary of the same Commission, died. Cause of death, "Yellow fever." Mr. Lemesurier's name is the first entry in the book, and Mr. Childers' the second. They fix a date. No Spanish records were available.

During the building of the Panama Railway (1849 to 1855), yellow fever swept away officers and laborers by the score. Colonel George M. Totten had the disease, and recovered. It killed his son. To form an idea of the cost of the Panama Railway in lives the reader is referred to "Panama in 1855," published by Harper Brothers, New York. The climate and its death-dealing proclivities are there described at length by an able writer, who visited the isthmus as a guest of the Panama Railway, but who returned to New York to state the exact truth.

In 1868 the disease again was epidemic on the isthmus. It killed afloat and ashore. The United States Steamer "Jamestown" lost eighty of her officers and crew, who were buried on Dead Man's Island, three miles from the City of Panama. Here let me cite an important fact regarding the resisting power of the germs of yellow fever. The "Jamestown" was sent to the North Pacific and kept there for a long time. Then she was ordered to the Sandwich Islands, when the disease again manifested itself. Several years in the North Pacific had failed to kill them.

Yellow fever has been endemic in Panama from time immemorial. In 1880 it was epidemic on the whole isthmus. During that epidemic I saw the disease in both of its cities and had it myself in Panama, and was squarely told by my physician that my case "was utterly hopeless." Not very cheerful, but a fact all the same. To temperate habits, I believe, I owe my life. I was one of the happy exceptions to the rule that it kills nearly all cases at Panama.

Between May and September in that year the Colombian troops in the Panama garrison lost one hundred and eighty men and camp followers, smallpox and yellow fever both being epidemic.

Previous to two years ago, all the soldiers and poor, or the great majority, were buried in a small lot of less than an acre. Year by year it was dug up and over for new arrivals, to liberate millions of germs. Jointly with Mr. John Stiven we made a vigorous protest through the columns of the

\* Report of National Board of Health, 1879, and Macaulay's History of England.

*Star and Herald*, in English and Spanish, against the wholesale dissemination of disease. That put a stop to an abuse that had gone on, year by year, for over half a century.

The better classes were buried in niches or *bovedas*, in a large quadrangle of masonry; the niches were in tiers. After a given time, eighteen months, if the rent were not renewed, the coffins were cast out, broken, etc. As many as sixty-seven coffins were seen at one time, open and closed, disclosing fearful sights. It was a capital place to collect crania, as the Museum of McGill College, Montreal, testifies, but regarding how they got there clearly "it is not for me to say."

Next, to the advent of De Lessep's canal engineers, on the twenty-eighth of February, 1881. That meant a lot of new food. Within a year, yellow fever was claiming victims among them. From the epidemic of 1880, it remained endo-epidemic. In 1882, between July and September, fifteen deaths occurred from yellow fever in the Canal Hospitals, in Colon, a fact duly communicated by me to the National Board of Health at Washington. The then United States Consul, Mr. James Thorington, issued clean bills of health at a time when the President of the State Board of Health of Panama, Dr. Quijano Wallis, pronounced it, and smallpox endemic.

In September, 1884, the harbor of Colon was full of shipping. The latter became infected, the "*Effecthia*," a brig, lost all her crew but the cook. Two French steamers of *La Compagnie Generale Transatlantique*, named the "*M. Bixio*," and the "*Fournel*," lost twenty men. The Royal Mail Steamers "*Larne*," and "*Nile*," also lost a few between September and January, 1885. One hundred and seventy cases had occurred there, with a mortality of over two thirds. I saw the records when in Colon, in February, 1885. I visited Colon purposely to see things for myself. An English ship, the "*City of Liverpool*," had had six cases on board. She was at the dock, within twenty-feet of her stern was a large pile of rock-ballast from *Bohio Soldado*, being that sold by the Panama Railway to all vessels requiring it. The "*Grace Bradley*," an American three-masted schooner, was in the berth next to the "*City of Liverpool*." She had discharged a cargo of ice, and was taking in the ballast. Two of her crew sickened with the disease and died. She sailed for a southern port, United States of America, with a foul bill of health from United States Consul, R. K. Wright, Jr., of Colon. She arrived at a southern port late in the Fall, discharged the ballast on flat cars that dumped it into the sea, and proceeded direct to Philadelphia. This infected ballast some day will speak louder than words to the people of the South. It comes from an infected port. Ballast of this kind caused three cases of yellow fever in New Orleans, in 1882. The ballast was thrown on a street there.\*

Another fact for students of yellow fever. In 1881 a vessel called "*La Renie des Anges*," made Colon. She had yellow fever on board. Later, the canal company bought her for a coal hulk. When the epidemic appeared in the shipping of Colon in 1884, she was hauled into the dock and discharged her coal, and was made an hospital ship for yellow fever victims. After the epidemic was over, she was disinfected (a wooden ship) and again became a coal hulk, to be anchored in the midst of the shipping. In February, 1885, I saw her in the thick of the shipping in that crowded port. That vessel is a standing menace to the shipping of Colon.

I left Panama on the twenty-fifth of April, 1885, for New York, and was

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\* "Yellow fever in Vera Cruz, and Colon, in 1882." *New Orleans Medical and Surgical Journal*, 1884.

in the isthmus again in February and April of this year, when I again sailed on the twelfth of April for New York, via New Orleans. During my absence from the isthmus yellow fever had not been idle. Many would have termed it epidemic. In January, 1886, out of one hundred and forty-nine burials for Panama in the general cemetery, twenty-two were from yellow fever. February, one hundred and sixty-three burials, thirty-five from yellow fever. March, one hundred and ninety-nine burials, forty-three from yellow fever. Apart from these, there were the burials in the Chinese, Foreign, and Jewish Cemeteries, many being from yellow fever.

There were many cases both in Colon and Panama, when I sailed. In December, 1885, thirty deaths from it, all Americans, were registered at the American Consulate at Colon. In March, 1886, fifteen canal men died of it in the Colon Hospital. A late letter from a gentleman in Colon refers to the great sickness on the isthmus, the death of Mr. Boyer, the Director-General of the canal-works in Panama, and many prominent men, all from yellow fever. Colon was spoken of thus: "People were dying in the streets." Cause not stated. They were "dumped into the grave, unlettered, unnumbered, and unknown."

In May and June last it was declared epidemic at Panama, Dr. Amador Guerrero, the *Doyen* of the Colombian physicians in Panama having so pronounced it. In May the *New York Herald* placed the daily dying from it at forty. Subsequently the *Herald* confirmed its first statement by saying that forty a day was an underestimate. In June I met a merchant from Panama, then in New York. He said that on a certain Sunday previous to his leaving the City of Panama he had counted thirteen funerals pass his place of business, "all foreigners and all yellow fever."

There was a great deal of sickness and death this and last year among the Colombian soldiers. The *Star and Herald* this Spring gave on its Spanish side the figures furnished it by Dr. Quijano Wallis, the military surgeon and President of the Board of Health of the State of Panama. The deaths in the last half of 1885 was about fifteen per centum of all admissions to the military hospital. Later it rose to twenty-two per centum; that was during the early months of 1886, the chief causes being yellow and malarial fevers and dysentery.

In July, 1884, the *Star and Herald*, on its English side, when the health of the isthmus was good—for it—published the death rate among the canal men as being one hundred and nine per thousand. A canal surgeon furnished the figures: In November, 1884 (remember the epidemic in the harbor of Colon), the Canal Company buried six hundred and fifty-two officers and men from all causes. From this it will be seen that the Isthmus of Panama is not the garden of paradise that Mons. de Lesseps represents it to be in his *Bulletin du Canal Interocéanique*.

While the details are lengthy, they are necessary to place the truth squarely on record, with a view of transfixing the fictions of canal managers *et al.*

During my residence at Panama, a number of foreign physicians in practice tried to bring about a different state of affairs. Letters were written to the press. While the attempt exposed the situation and its dangers, no good came of it. A series of letters were published in the *Star and Herald* by George E. Gascoigne, M.D.M.R.C.S., England, Benjamin Stammers, L.R.C.P. and S., Edinburgh, and the writer.

Now to place the City of Panama before the reader. The old City of *Panama Viejo*, lies about four miles southwest of modern Panama. Old Panama was destroyed in 1670 by Morgan. It is the oldest city in the three Americas. Modern Panama was built in 1688 as a strongly walled city. The walls in many places remain in excellent condition. They cost \$11,000,000. The city is built on a peninsula of volcanic rock, jutting out into the Bay of Panama. The Spaniards were grand builders and selected excellent sites.

The visitor to Panama of to-day, the city being the Pacific terminus of the Panama Railway, will find the main *plazas* or squares cleanly swept; also many of the streets. I refer to the city proper, or what was intramural Panama. The inhabitants, whose houses have no water-closets, save and except perhaps twenty in the city with a population of twenty thousand, throw all the refuse of the houses and fecal matter over the seawalls, where it accumulates above the reach of the tides. The heaps are abominations, and their death-dealing odors are unbearable. Heat and moisture are never absent to aid fermentation of fecal matters. These accumulations "that smell unto heaven" have been described time and again by the *Star and Herald*, but nothing results. That paper has paid for its experience in common with others. Mr. James Boyd, its late proprietor, died of malignant smallpox in 1881, and Mr. Hugh Boyd, likewise a pressman, died last Summer of yellow fever.

Panama has a few old time drains, also a few badly constructed modern ones. The city has no waterworks, or any means of flushing them. Many of the old drains have become choked up. They are simply storehouses for fermenting fecal matters in the dry season. During the rains they overflow to flood the streets. The vile odors that pour from the gratings in the streets, and *patios* or yards, are pestilential and disease producing.

The Isthmus of Panama was happily named "The Gate to the Pacific," by Captain, now Admiral, Bedford Pim, R. N. There is a city almost two hundred years old, on one of the world's greatest highways, without water and without drainage. Panama to-day receives her water from a few old time wells on the outskirts. Three of the largest from which the watermen get their supply, are at Cocoa Grove. They are in a small ravine, within two hundred feet of a new cemetery, and fully forty feet below its level. Within two years, or between July 15, 1884, and April 12, 1886, that cemetery had received three thousand eight hundred and eighty-four bodies buried in the earth; and several hundred had been placed in the stone niches or *boredas*. Just beyond this cemetery is the Chinese Cemetery, and opposite is the old cemetery and *boredas* already referred to, as well as the Jewish Cemetery and the Foreign Cemetery; all lying between the city and the base of Mount Aucon.

At the time the new cemetery was being got ready, the writer visited it with Mr. Felix Target, C.E., a member of the Institute of Civil Engineers of Great Britain, and hydraulic engineer to the Government of Jamaica. The wells were condemned by him, and publicly denounced through the columns of the *Star and Herald* and *La Estrella de Panama*. They, and the old system of burying and unburying the dead, were vigorously treated. Señor Damaso Cervera, the President of the State of Panama, through the President of the Board of Health, said that they should be closed when the cemetery opened. The cemetery and wells are under one management. Don Nicanos Obarrio, who has a Government contract for burying the dead, a royalty so to speak, for all the cemeteries, he owns the wells; they

drain the cemeteries; he sells the water; thus the one is furnishing victims for the other to this day and hour. People use the cemetery drainage for drinking purposes, and yet, strange to say, Panama remains unhealthy!!! It is a paradise for physicians, if they can escape dying themselves.

Next in order, let us consider the suburbs and outskirts of the city, or extra-mural Panama. The poorer classes throw all refuse into vacant lots, old wells, and into the streets. Piles of filth, unmentionable, may be seen on main thoroughfares. Near the gasworks there are several slaughter houses; two kept clean, one for pigs is filthy and odoriferous to a degree. The slaughter houses are within two hundred yards of the city proper. The entrails from the cattle are thrown down the bank, also their heads, to poison the atmosphere. Oftentimes, large masses of intestines are floated by the tides and left stranded by them at low water along the city front. Such is Panama to-day.

Mr. Leblanc, an old timer, told Mons. de Lesseps, during his first visit to Panama, in 1880, that if he ever built a canal there, the trees of the whole isthmus would not furnish wood enough for crosses for the graves of workmen. Thousands of deaths among canal men promises to make Mons. Leblanc's statement fairly good.

Near the gasworks an old well has been filled with bedding, on which people have died. The lane running from the cemetery to the beach also presented April last a fine collection of bedding, cots, etc., with the same history, and yet some people there affect astonishment that the isthmus is unhealthy, and deny it.

Mount Aucon rises behind the city. Its highest point is five hundred and four feet above sea level. From it one looks down on Panama, on its rocky peninsula. Facing about, Rio Grande, the river, and hamlet of that name, are seen. For miles and miles swamps intersected by small streams meet the eye. The small streams bring down vegetable and animal matter from the interior and the canal camps. The swamps are partly submerged by every tide. The tides in Panama rising from sixteen to twenty-two feet, twice in twenty-four hours they are flooded; twice in twenty-four hours they are under the direct rays of a tropical sun. For intense malarial poisoning, the isthmus is famous; it is well known in the Old Country as the "Grave of the European."

#### COLON, THE ATLANTIC CITY OF THE ISTHMUS.

Colon, once called Aspinwall, is the Atlantic city and terminus of the Panama Railway; the distance between the two cities being about forty-seven miles. Colon is built on an island of the same name. The island is of a coralline formation: it is about a mile long, by about a third of a mile in width. Its center is made up largely of lagoons, swamps, and clumps of mangroves; the whole mixed with a luxuriant tropical vegetation.

I walked around the island last April. On the beach back of the city there was an immense collection of refuse, bedding, a few dead animals, etc.

The Island of Colon has no drainage: its surface being only three or four feet above the ocean. The rise of the tides is very small, only some sixteen inches. A large and foul lagoon occupies a prominent place in the very heart of the city. It is built over and around, and receives filth of all kinds, including privies. It has no outlet; it is foul, its waters are green, and death dealing.

Many of the back streets were flooded, a foul, green water covering them,



on whose surface breaking bubbles told of the fermentation going on below. Many of the streets were flooded from sidewalk to sidewalk, planks connecting them. The inhabitants on them, nearly all natives and Jamaicans, throw all the refuse, etc., of their houses out of the first door or window that offers, and add to the perpetual nastiness.

The great fire of March 31, 1885, that swept Colon, exposed the numberless privies and pits, whose contents have poisoned the whole subsoil and the porous coralline formation. Colon to-day is nearly rebuilt, but the lagoon and the old time conditions are there, and always will be there. The presence of thousands of laborers on that small island has contaminated its whole surface. An English physician called it the "inhabited cesspool." Truly it is a malodorous spot and theme.

During the epidemic of yellow fever of 1880, Colon suffered severely; many passengers sailing from that port died en route. Both Colon and Panama are hotbeds and distributors of the disease. In 1882, a vessel named the "Ile Marthe" took on three hundred tons of Bohio Soldado rock-ballast at Colon, and cleared for New Orleans. The ballast was used for raising the level of a street. In its immediate vicinity yellow fever appeared at once, and three cases died.\* While the "Ile Marthe" was at Colon, there were many cases of yellow fever. Between May and September, 1882,† the Canal Hospital there reported twenty-nine cases and nineteen deaths, Dr. de Courval being in charge. Dr. Homer Hitchcock, the Resident Surgeon to the Panama Railway, saw three cases in one vessel. In the face of all this, and of my information to the National Board of Health‡ that there were many cases of yellow fever, Mr. James Thorington, then United States Consul, gave vessels clean bills of health. The then Board of Health in New Orleans accepted his views, and in its report,§ published seven pages of letters to show that there was no yellow fever at Colon up to October, 1882. Dr. Joseph Jones, then its President, wrote to Dr. Quijano Wallis, the President of the Board of Health of the State of Panama, for his opinion, and, strange to say, published his reply *in extenso*, but in the original Spanish, and in summing up the report, made it say in English, what it never stated in Spanish—thus: "From the preceding courteous and valuable communication of President Quijano Wallis, it is evident that during the Spring, Summer, and Autumn, up to the thirtieth of October (1882), the actual sanitary condition of the ports of Panama and Colon was good, and that they were free from such epidemics and contagious diseases as smallpox and yellow fever.

In addition to willfully perverting the truth, the then Board of Health of Louisiana denied that the ballast came from Colon, stating that it came from Cardenas, Wales.§ Now for the real facts of the case. What my friend, Dr. Quijano Wallis, then and now President of the Board of Health of Panama, really said at the close of his letter of date October 13, 1882, to President Jones, translates thus: "The actual sanitary condition of the ports of Panama and Colon is, generally speaking, good, as there does not prevail at present any of the usual epidemic diseases, it being a well known fact that smallpox, yellow fever, and the malarial fevers in their numerous varieties and forms, are never missing in these inter-tropical regions where they are truly endemic."

As stated, the Board of Health declared that the ballast of the "Ile

\* New Orleans Medical and Surgical Journal, 1884.

† Annual Report National Board of Health, Washington.

‡ New Orleans Medical and Surgical Journal, January, 1884.

§ Annual Report Board of Health, State of Louisiana, 1882.



Marthe" had been taken on board at Cardenas, Wales. The following certificate was obtained by me, in duplicate, one copy being sent to Dr. Stanford E. Chaillé, a member of the National Board of Health of New Orleans, and was published by him.\* This clears up the origin of her ballast; it came from Bohio Soldado, on the line of the Panama Railway.

CONSULATE OF THE UNITED STATES OF AMERICA, }  
AT COLON, February 28, 1885. }

May 27, 1882, ship "Hé Marthe," three hundred tons of ballast, at \$2 50, \$750.

I, the undersigned Consul of the United States of America for Colon and the dependencies thereof, do hereby certify that the above extract is a true and faithful copy of an original entry in the books of the Panama Railroad Company, the same having been carefully examined and compared by me and found to agree, word for word and figure for figure.

Given under my hand and seal of this Consulate, at Colon, the twenty-eighth day of February, 1885.

{SEAL.}

R. K. WRIGHT, JR.,  
U. S. Consul, Colon.

The facts just cited are very instructive, as showing how a Board may betray the interests it is paid to protect.

The Board of Health of the State of Louisiana, since 1884, has been under the very able management of Dr. Joseph Holt.

New Orleans has had her experience with the Colon rock ballast. Now it is all thoroughly disinfected, and has been since I placed the exact facts before Dr. Holt.

The people of the State of Louisiana, and of the South, may be congratulated on the Louisiana Board of Health. It gives the City of New Orleans, and the South generally, the maximum of protection, and commerce and shipping the extreme minimum of detention, a single day in many cases. Its quarantine is truly the ideal quarantine long sought, and is the creation of Dr. Joseph Holt, the President of the Board. But for its watchfulness several ships from the isthmus, now at Quarantine Island with yellow fever on board, would probably have set up an epidemic in New Orleans. The 1878 epidemic cost the South twenty-two thousand lives.

Acting Surgeon-General Stone, of the Marine Hospital, Washington, in his recent report of the nineteenth of August, referred to vessels now in quarantine, and said that there was no danger of the disease spreading; and there is none, if the isolation is real and absolute. The upright methods and truthfulness of the Board of Health of Louisiana commands the admiration of all sanitarians, and the country at large.

That Board will guard the Atlantic at Louisiana, and now that there is all rail communication between it and California, it has a direct bearing on the question of "Yellow Fever in its Relation to the State of California."

Enough has been placed before the reader to illustrate what risks all ports and cities run that are in communication with Colon and Panama, and the west and east coasts of Mexico. California's greatest danger is from the Pacific, from Guaymas, Mexico, by rail, and the steamers from the coast to San Francisco.

#### CALIFORNIA HAS A MAGNIFICENT CLIMATE.

Two visits to it, one in 1880, and the second in 1885, gave me ample evidence of it. Climate is not everything, and pure air is not necessarily germicidal. Did the climate of California shut out cholera? It did not.

\*New Orleans Medical and Surgical Journal, 1884.

From New York, a steamer took the disease to the Isthmus of Panama. It became epidemic. The Seventh United States Infantry was on the isthmus, en route to California, in 1852, Captain U. S. Grant was with them, and states\* that fully one seventh of that regiment (the Seventh) were killed by it.

Later, vessels en route to California left the disease at every port they touched at in Central America and Mexico. The Republic of Nicaragua, with a small population of two hundred and ten thousand, lost eighteen thousand. The Republic of Guatemala was severely punished. While there, in 1885, Mr. Urruella told me about its appearance in the City of Amittitlan, where five thousand died in a population of forty thousand. It got up into lofty mountains, and did its fatal work, La Antigua, six thousand feet above sea level, suffering severely.

California, on the coast, has fogs and "muggy weather." A recent writer on England, says, that it has "plenty of weather, but no climate." Let us say, that both climates are equally cool, and unfriendly to the diseases of hot climates, properly so called. Yet, as has been shown, yellow fever was introduced into England, and developed two circumscribed epidemics.

France claims a fine climate, yet yellow fever was epidemic at Saint Nazaire.† These facts, familiar to all students of yellow fever, are cited to cause unthinking people to awake to the situation. Let Californians remember the experience of her neighbor, Mexico, within whose borders yellow fever is permanently domiciled. Remember Colona, with her past magnificent reputation for health, and her fearful punishment by yellow fever. Climate *quoad* Science if you will, climate is not everything.

During my visits to California I traveled in its southern and central portions. In the Sacramento Valley I saw many things that recalled the tropics. Heat, moisture, swamps, etc. *I wish to state here boldly, and with all the emphasis that our mother tongue conveys to an intelligent mind, that if yellow fever is introduced here during the hot months, that it will be true to its traditions and pile up a fearful record.* Again, let skeptical and careless people remember Mexican experience. Mazatlan, a charming city by the sea, lost fully one third of her population by their moving away, and her commerce probably never will assume its former proportions.

Here I must close this lengthy communication. "Forewarned is forearmed." The people of the State of California have a Board of Health, presided over by men of recognized wisdom and ability. They have the skill; they have the scientific knowledge. Let the State give them the necessary power and means, to enable its Board to stand "shoulder to shoulder" with that of Louisiana. Then, but not until then, the Golden State can bid defiance to the diseases knocking at her portals, and menacing her people, commerce, and her grand and deserved reputation for healthfulness, and a climate that is unequaled.

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\* Grant's Memoirs, vol. 1.

† Le Fievre Jaune á Saint Nazaire.

## DISINFECTION AND INDIVIDUAL PROPHYLAXIS AGAINST INFECTIOUS DISEASES.

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### INTRODUCTION.

*Definition.*—We are met at the outset by a difficulty growing out of the fact that the word *disinfection*, as commonly used, has a very different signification from that to which certain recent authors would restrict it. Thus, the Committee on Disinfectants of the American Public Health Association defines a disinfectant as “an agent capable of destroying the infective power of infectious material.”\* In the preliminary report of this committee the reasons for restricting the meaning of the word within the limits justified by its etymology, and of our knowledge of the nature of “infectious material,” are very clearly stated, as follows:

The object of disinfection is to prevent the extension of infectious diseases by destroying the specific infectious material which gives rise to them. This is accomplished by the use of disinfectants.

There can be no partial disinfection of such material; either its infecting power is destroyed, or it is not. In the latter case there is a failure to disinfect. Nor can there be any disinfection in the absence of infectious material. \* \* \* \* \*

Popularly, the term disinfection is used in a much broader sense. Any chemical agent which destroys or masks bad odors, or which arrests putrefactive decomposition, is spoken of as a disinfectant. And in the absence of any infectious disease it is common to speak of disinfecting a foul cesspool, or a bad smelling stable, or a privy vault.

This popular use of the term has led to much misapprehension, and the agents which have been found to destroy bad odors—deodorizers—or to arrest putrefactive decomposition—antiseptics—have been confidently recommended and extensively used for the destruction of disease germs in the excreta of patients with cholera, typhoid fever, etc.

The injurious consequences which are likely to result from such misapprehension and misuse of the word disinfectant will be appreciated when it is known that recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.

This is true, for example, as regards the sulphate of iron or copperas, a salt which has been extensively used with the idea that it is a valuable disinfectant. As a matter of fact, sulphate of iron in saturated solution does not destroy the vitality of disease germs, or the infecting power of material containing them. This salt is, nevertheless, a very valuable antiseptic, and its low price makes it one of the most available agents for the arrest of putrefactive decomposition in privy vaults, etc.

Antiseptic agents also exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended when masses of organic material in the vicinity of human habitations cannot be completely destroyed, or removed, or disinfected.

While an antiseptic agent is not necessarily a disinfectant, all disinfectants are antiseptics; for putrefactive decomposition is due to the development of “germs” of the same class as that to which disease germs belong, and the agents which destroy the latter also destroy the bacteria of putrefaction, when brought in contact with them in sufficient quantity, or restrain their development when present in smaller amounts.

\* *The Medical News*, Philadelphia, January 24, 1885, p. 87.

A large number of the proprietary "disinfectants" so called, which are in the market, are simply deodorizers or antiseptics of greater or less value, and are entirely untrustworthy for disinfecting purposes.\*

The offensive gases given off from decomposing organic material are no doubt injurious to health; and the same is true, even to a greater extent, of the more complex products known as *ptomaines*, which are a product of the vital—physiological—processes attending the growth of the bacteria of putrefaction and allied organisms. It is therefore desirable that these products should be destroyed; and, as a matter of fact, they are neutralized by some of the agents which we recognize as disinfectants, in accordance with the strict definition of the term. But they are also neutralized by other agents—deodorants—which cannot be relied upon for disinfecting purposes, and by disinfectants, properly so called, in amounts inadequate for the accomplishment of disinfection. Their formation may also be prevented by the use of *antiseptics*. From our point of view the destruction of sulphureted hydrogen, of ammonia, or even of the more poisonous *ptomaines*, in a privy vault, is no more disinfection than is the chemical decomposition of the same substances in a chemist's laboratory. The same is true as regards all of the bad smelling and little known products of decomposition. None of these are "infectious material," in the sense in which we use these words; that is, they do not, so far as we know, give rise *directly* to any infectious disease. Indirectly they are concerned in the extension of the epidemic "filth diseases," such as cholera and yellow fever, and of the fatal endemic "filth diseases," such as typhoid fever and diphtheria, which in the long run claim more victims than do the pestilential maladies first named. This because persons exposed to the foul emanations from sewers, privy vaults, and other receptacles of filth, have their vital resisting power lowered by the continued respiration of an atmosphere contaminated with these poisonous gases, and are liable to become the victims of any infectious disease to which they may be exposed. Moreover, the accumulations of filth which give off these offensive gases furnish pabulum upon which certain disease germs thrive; and it may happen that the bad smelling air carries something worse than the poisonous gas which makes its presence known by offending the sense of smell. It may waft to our nostrils infectious particles which are beyond recognition by any sense, unless it be the sense of sight with the aid of a good microscope.

We desire, moreover, to have it fully understood that in restricting the meaning of the term disinfection within the limits given by the definition of the Committee on Disinfectants of the American Public Health Association, we do not wish to limit the practice of "disinfection," in the popular sense of the word.

It is but fair to say, also, that this popular usage is supported by good authority, and until quite recently has been the common acceptance of the term among physicians and chemists. Indeed, it is but a short time since the nose test was the only test of "disinfection" recognized by many intelligent persons.

Littré, in his Dictionary of the French Language, defines disinfectants as "substances which destroy, chemically, bad odors."

Vallin, the author of the best modern treatise upon "Disinfection and Disinfectants," says:

From a scientific point of view there is perhaps an impropriety in introducing into the idea of disinfection the suppression of odors which offend the sense of smell. The bad odor is not injurious in itself; it is an epiphenomenon, which does not necessarily give

\* *The Medical News*, April 18, p. 425.

the measure of the hurtful properties of the air, or of any substance whatever. The public, unacquainted with medicine, has an unfortunate tendency to judge of insalubrity by the bad odor; the absence of this gives to it a deceitful security; when they are masked by any device, it [the public] believes that all danger has been removed. *Nevertheless it is necessary to avoid violating the ordinary sense of words.\** An atmosphere which does not in the least offend the sense of smell may certainly be insalubrious, and engender the gravest maladies; but the fetid or disagreeable odors may reveal the presence of injurious principles, of toxic gases, or of organic matter in decomposition. We should not too much diminish the importance of these offensive odors in the eyes of the public; everything which smells badly is to be suspected.†

We agree with Professor Vallin, that the bad odors should arouse suspicion, and lead to the use of deodorants, or of antiseptics, or of disinfectants, if required; but let us not leave the public to suppose that when the bad odors have been neutralized, the offensive material has been disinfected. Let us rather instruct the public that to deodorize and to disinfect are not one and the same thing, and that deodorant and disinfectant are not synonymous terms. For our part we prefer to "violate the ordinary sense" of the word, and to restrict its signification within such limits as will prevent confusion, and, what is far worse, a reliance upon inefficient methods for the destruction of infectious material.

In the present essay we shall use the words disinfection and disinfectant, in accordance with the definition of the committee on disinfectants already given. But, inasmuch as this is intended to be a practical treatise for popular use, we shall also give, in the proper place, directions for the use of deodorants and of antiseptics, so that "disinfection," in the broad sense in which the word is commonly used, may be fully considered.

*Tests of Disinfection.*—What means have we of proving that the infective power of infectious material has been destroyed?

Evidence of disinfection may be obtained (*a*) from the practical experiments—experience—of those engaged in sanitary work; (*b*) by inoculation experiments upon susceptible animals; (*c*) by experiments made directly upon known disease germs.

(*a*) It is a matter of common experience, that when a room has been occupied by a patient with an infectious disease, such as smallpox, scarlet fever, or diphtheria, susceptible persons are liable to contract the disease weeks or even months after the patient has been removed from it, unless in the meantime it has been disinfected. If a second case does occur from exposure in such a room, it is evident that it has not been disinfected. But the non-occurrence of subsequent cases cannot always be taken as evidence that the means of disinfection resorted to were efficient. Negative evidence should be received with great caution. In the first place, the question as to whether susceptible individuals have been fairly exposed in the disinfected room must be considered. Then it must be remembered that susceptible persons do not always contract a disease, even when they are exposed in a locality known to be infected. A further difficulty in estimating the value of evidence obtained in practice arises from the fact, that, in connection with the special means of disinfection resorted to, such as fumigation, hanging up cloths saturated with a disinfecting solution, etc., it is customary to resort to additional precautionary measures, such as washing surfaces with soap and hot water, whitewashing plastered walls, and free ventilation. It is apparent that under these circumstances it would be unsafe to accept the fact, that no other cases occurred in a room treated in this way, as evidence that the particular disinfectant used is efficient for the destruction of the infectious agent of the disease in question. The fond mother who

\*Italics by present writer.

†Op. cit., p. 2.

attaches a charm to her child's neck to protect it from evil, also takes the precaution of guarding it from contact with other children who are sick with any infectious disease. If her child fortunately grows to manhood or womanhood without having suffered an attack of scarlet fever or diphtheria, she may imagine that her charm has protected it, but the evidence upon which her faith is founded is not of a nature to convince those who are familiar with scientific methods of demonstration. "Well educated" persons are often ready to testify in favor of methods of disinfection, or of treatment, upon evidence which, from a scientific point of view, has no more value than that which the fond mother in question has to offer in favor of the little bag containing camphor or assafœtida, or some other charm of equal value, which she has attached to her child's neck to keep it from catching scarlet fever or diphtheria at school. On a par with these charms, so far as disinfection is concerned, we may place the saucer of chloride of lime, which it was formerly the fashion to place under the bed of a patient sick with an infectious disease, the rag saturated with carbolic acid, or chloride of zinc, suspended in the sick-room, and even the fumigations with burning sulphur, as sometimes practiced by those who are unfamiliar with the evidence as to the exact value of this agent, and the conditions necessary to ensure successful disinfection with it.

Chloride of lime, sulphurous acid gas, and carbolic acid are among our most useful disinfecting agents, but disease germs are not to be charmed away by them any more than by a little bag of camphor.

Having pointed out the fact that negative evidence, in a restricted field of observation, must be accepted with great caution in estimating the value of disinfectants, we hasten to say that the combined experience of sanitarians, derived from practical efforts to restrict the extension of infectious diseases, is of the greatest value, and that this experience is to a great extent in accord with the results of exact experiments made in the laboratory.

(b) Inoculation experiments upon susceptible animals, made directly with infectious material which has been subjected to the action of a disinfectant, have been made by numerous observers. The proof of disinfection in this case is failure to produce the characteristic symptoms which result from inoculation with similar material not disinfected. Thus, Davaine found that the blood of an animal just dead from the disease known by English writers as anthrax or splenic fever (*Fr. Charbon*), inoculated into a healthy rabbit or Guinea pig, in the smallest quantity, infallibly produces death within two or three days; and the blood of these animals will again infect and cause the death of others, and so on indefinitely. This anthrax blood therefore was infectious material, which could be utilized for experiments relating to the comparative value of disinfectants. Davaine made many such experiments, not only with the blood of anthrax, but also with that of a fatal form of septicæmia in rabbits, which is known by his name. Other investigators have followed up these experiments upon infectious material of the same kind, and also upon material from other sources—*e. g.*, the infectious material of glanders, of tuberculosis, of symptomatic anthrax, of fowl cholera, of swine plague, etc.

It has been proved that the infectious agent in all of the diseases mentioned is a living germ, and that disinfection consists in destroying the vitality of this germ. But in experiments made with blood or other material obtained directly from diseased animals, the results would be just as definite and satisfactory if we were still ignorant as to the exact nature of the infecting agent. The test shows the destruction of infecting power

without any reference to the cause of the special virulence, which is demonstrated to be neutralized by certain chemical agents in a given amount. All of the experiments made with the above mentioned kinds of virus have been made upon the lower animals; but there is one kind of material which it is justifiable to use upon man himself, and with which numerous experiments of a very satisfactory character have been made. This material is vaccine virus. Fresh vaccine, when inoculated into the arm of an unvaccinated person, gives rise to a very characteristic result—the vaccine vesicle. The inference seems justified that any agent which will neutralize the specific infecting power of this material will also neutralize the small-pox virus. Thus far it has not been definitely proved that the infective agent in vaccine virus is a living germ; but the numerous experiments made have shown that the chemical agents, which have the power of destroying the various kinds of infectious material heretofore mentioned, have also the power, in about the same amounts, of neutralizing vaccine virus, as shown by its failure to produce any result when inoculated into an unvaccinated person. In these experiments the more careful investigators have taken the precaution of vaccinating the same person with disinfected and with non-disinfected virus from the same source. A successful vaccination with the non-disinfected virus shows that the individual is susceptible, and the material good: failure to produce any result is evidence that the potency of the disinfected virus has been destroyed by the chemical agent to which it was exposed.

(c) As already stated, it has been demonstrated that the infectious diseases of the lower animals, which have furnished the material for experiments upon disinfectants by the method of inoculation, are “germ diseases,” and that the infectious agent is in each case a living micro-organism, belonging to the class known under the general name of *Bacteria*. The bacteria are vegetable organisms, which, by reason of their minute size and simple organization, must be placed at the very foot of the scale of living things. But they make up in number and in rapidity of development for their minute size: and there is good reason for believing that the infectious diseases of man are also caused by pathogenic—disease-producing—organisms of the same class. Indeed, this has already been proved for some of these diseases, and the evidence as regards several others is so convincing as to leave very little room for doubt.

Many of these disease germs are now known to us, not only by microscopic examination of the blood and tissues of infected animals, but also by “culture experiments.” That is, we are able to cultivate them artificially in suitable media, and to study their mode of development, etc., in the laboratory, quite independently of the animals from which our “pure cultures” were obtained in the first instance. The culture fluids used are prepared from the flesh of various animals; and when to one of these a certain quantity of gelatine is added, we have a “solid culture medium,” upon the surface of which some of these germs will grow most luxuriantly. To start such a “culture,” it is only necessary to transfer, with proper precautions, a minute quantity of the infectious material to the surface of our culture medium, or into a fluid which has been found to be suitable for the growth of the particular organism which we desire to cultivate. A second culture is in the same way started from the first, and so on indefinitely.

Now it is evident that these “pure cultures” furnish us a ready means for testing the power of various chemical agents to destroy the vitality of known disease germs, as shown by their failure to grow in a suitable culture medium after exposure for a given time to a given percentage of the

disinfectant. Very many experiments of this nature have been made during the past three or four years. The reader who desires fuller details as to the method of conducting such experiments, and of the results obtained, is referred to the preliminary reports of the Committee on Disinfectants, of the American Public Health Association, published during the current year (1885) in the *Medical News*, Philadelphia, and which will, doubtless, also be published in full in the next annual volume of the association. We may say here that the experimental data on record indicate that those agents which are efficient for the destruction of any one of the pathogenic organisms upon which experiments have been made, or of harmless species of the same class—*e. g.*, the bacteria of putrefaction—are efficient for the destruction of all, *in the absence of spores*. There is, it is true, within certain limits, a difference in the resisting power of different organisms of this class to chemical agents. This is not, however, sufficiently marked to prevent the general statement that *a disinfectant for one is a disinfectant for all, in the absence of spores*.

The last clause of the above statement calls for an explanation, and certain details with reference to the mode of reproduction of disease germs. All of the bacteria multiply by binary division; that is, one individual divides into two, and each member of the pair again into two, and so on. The spherical bacteria, known as *micrococci*, multiply only in this way, but the rod-shaped bacteria, or *bacilli*, also form spores. These spores correspond with the seeds of higher plants. They are highly refractive, oval or spherical bodies, which, under certain circumstances, make their appearance in the interior of the rods, which cease to multiply by binary division when spore formation has taken place. The point of special interest with reference to these spores is, that they have a resisting power to heat, and to the action of chemical disinfectants, far beyond that which is possessed by micrococci, or by bacilli without spores. The difference may be compared to the difference between a tender plant and its seeds to deleterious influences, such as extremes of heat and cold. Thus the spores of certain species of bacilli withstand a boiling temperature for several hours, while a temperature of 150° Fahrenheit quickly kills most bacteria in the absence of spores. A similar difference is shown as regards the action of chemical agents. Certain agents—*e. g.*, sulphurous acid gas and carbolic acid—which are extensively used as disinfectants, have been proved by exact experiments to be quite impotent for the destruction of spores. This being the case, it is advisable, in practical disinfection, always to use an agent which has the power of destroying spores, in those cases in which the exact nature of the disease germ has not been demonstrated. The cholera germ of Koch does not form spores; and there is good reason to believe that the same is true as regards the germs of yellow fever, of scarlet fever, and of smallpox, which have not yet been demonstrated. This inference is based upon evidence obtained in the practical use of disinfectants, and upon certain facts relating to the propagation of these diseases.

A second general statement, which is justified by the experimental evidence on record, is that *agents which kill bacteria in a certain amount, prevent their multiplication in culture fluids, when present in quantities considerably less than are required to completely destroy vitality*.

An agent, therefore, which, in a certain proportion and in a given time, acts as a "germicide" in a smaller quantity, may act as an *antiseptic*—*i. e.*, may prevent putrefactive decomposition by restraining the development of the bacteria of putrefaction. Antiseptics also prevent or retard the development of pathogenic bacteria. It follows from this that germi-



cides are also antiseptics; but the reverse of this proposition is not true, as a general statement, for all antiseptics are not germicides. Thus alcohol, common salt, sulphate of iron, and many other substances which are extensively used as antiseptics, have scarcely any germicide power, even in concentrated solutions, and, consequently, would be entirely unreliable as disinfectants.

Practically, antiseptics may accomplish the same result in the long run as we obtain in a short time by the use of disinfectants. If, for example, we prevent the development of the germs of cholera, or of typhoid fever, in an infected privy vault, by the continued use of antiseptics, these germs will in time lose their ability to grow, when introduced into a suitable culture medium. But in the meantime there is always the possibility that some of them may escape, with the fluid contents of the vault, into the surrounding soil, and contaminate some well or stream from which drinking water is obtained. For this reason privy vaults, cesspools, and sewers should never be allowed to become infected. All infectious material, such as the dejections of patients with cholera or typhoid fever, should be destroyed at its source, in the sick room; or, if it is ascertained that such material has been thrown into a privy vault, the entire contents of the vault should be promptly disinfected. The same rule applies to infectious material thrown upon the ground, or wherever it may be.

Finally, we desire to emphasize the following propositions:

*Disinfection* consists in extinguishing the spark, killing the germ, which may light up an epidemic in the presence of a supply of combustible material—filth.

The object of *general sanitary police* is to remove this combustible material out of the way, so that no harm may result even if the spark be introduced.

*Antiseptics and deodorants* are useful when it is impracticable to remove offensive organic material from the vicinity of human habitations, but they are a poor substitute for cleanliness.

## PART FIRST.

### *Disinfection.*

It will be our aim in the present chapter to give reliable, practical directions with reference to the use of disinfectants, and the best methods of disinfection. Keeping this object in view, we shall recommend for disinfecting purposes only those agents named in the following list:

#### *Group 1.*

Disinfectants which have the power of destroying spores:

1. Fire.
2. Steam under pressure (25 lbs.).
3. Boiling water.
4. Chloride of lime (in solution).
5. Liquor soda chlorinate.
6. Mercuric chloride (in solution).

#### *Group 2.*

Disinfectants which are effective in the absence of spores:

7. Dry heat (230° Fahr. for two hours).
8. Sulphur dioxide.
9. Carbolic acid.
10. Sulphate of copper (in solution).
11. Chloride of zinc (in solution).

NOTE.—In the present state of knowledge, a division of disinfecting agents into two groups becomes necessary, unless we would entirely dispense with the use of those agents named in our second group, which cannot be relied upon for the destruction of spores, and consequently cannot be recommended for the destruction of all kinds of infectious material. As this group includes several agents which are extensively used for disinfecting purposes, and which we believe to possess great practical value, we have considered it necessary to make this distinction. The present state of science, however, does not enable us to classify all infectious diseases in the same way, and in case of doubt it will always be advisable to use those agents included in Group 1. But in the absence of a precise knowledge of the nature of the germ, we may in certain cases be governed by the practical experience of sanitarians, and by experiments which have been made directly upon infectious material, *e. g.*, on vaccine virus. In our recommendations we have taken account of this kind of evidence, as well as of laboratory experiments, in which known disease germs or harmless organisms of the same class have served as the test of disinfecting power.

We shall first give a brief account of the conditions of successful disinfection with these agents, as established by experimental data, and afterward detailed directions for their employment under the various circumstances in which disinfection is required.

1. *Fire*.—It is hardly necessary to say that burning of infectious material, infected clothing, etc., is an effectual method of disposing of it. This method of disinfection is always to be recommended, when practicable or consistent with a due regard for economy and the rights of individuals. As a rule, articles of little value, which have been soiled with infectious material, had better be burned; and this is especially true of old clothing and bedding. But we have other efficient methods of disinfection, which make it unnecessary to sacrifice articles of value except under unusual circumstances.

2. *Steam under Pressure*.—The disinfecting power of steam given off from boiling water in an open vessel does not differ from that of the water itself, but confined steam has a temperature corresponding with the pressure as indicated by a steam gauge. At twenty pounds pressure the temperature is about 230° Fahr. (105° C.); at twenty-five pounds it is about 240° Fahr.; at thirty pounds it is 250° Fahr. Moist heat at the lowest temperature named destroys the most resistant spores in twenty minutes, while a temperature of 240° Fahr. is effective almost immediately.\*

3. *Boiling*.—In the absence of spores, bacteria are quickly killed at a temperature considerably below the boiling point of water, and it is safe to say that boiling for half an hour will destroy all known disease germs, including the spores of anthrax, which have less resisting power than the spores of certain harmless and widely distributed bacilli, which have been found to resist boiling for several hours.

4. *Chloride of Lime* (chlorinated lime, bleaching powder).—This is one of the cheapest and most efficient of disinfectants. It should be packed in air-tight and moisture-proof receptacles—glass is preferable—and should contain at least twenty-five per cent of available chlorine.† It should be used in solution, which had better be made as required. An insoluble residue will be left, which may be removed by filtration or decantation. This, however, is not at all necessary. Chlorinated lime owes its disinfecting power to the presence of the hypo-chlorite of lime, a salt which is freely soluble in water, and which is quickly decomposed by contact with organic matter. Germs of all kinds, including the most resistant spores, are destroyed by this solution, but it must be remembered that the disinfectant itself is quickly decomposed and destroyed by contact with

\* See Preliminary Report of Committee on Disinfectants, in *The Medical News*, Philadelphia, March 14, 1885, p. 284.

† The test for available chlorine is given in Preliminary Report No. 11 of the Committee on Disinfectants, *l. c.*, Jan. 7, p. 148.

organic matter, and that if this is present in excess, disinfection may not be accomplished, especially when the germs are embedded in masses of material which are left after the hypo-chlorite of lime has all been exhausted in the solution.

5. *Liquor Soda Chlorinatae* (Labarraque's solution).—This is a solution of the hypo-chlorite of soda. Its value as a disinfectant corresponds with that of solutions of hypo-chlorite of lime of the same strength. The preparations in the market vary greatly in value, and some of those tested by the committee on disinfectants\* were found to be practically without value. This is due to the fact that the solution does not keep well. For this reason, and on the score of economy, a solution of chloride of lime will be preferable for most purposes. Labarraque's solution is, however, a more pleasant preparation for bathing the surface of the body, and both as a deodorant and a disinfectant will be found useful in the sick-room. It should contain at least 3 per cent of available chlorine.

6. *Mercuric Chloride* (bichloride of mercury, corrosive sublimate).—This salt is well known as a deadly poison, which has long been used in domestic practice as a "bug poison." Recent researches show that it has germicide powers of the first order, and it is consequently a disinfectant which may be recommended for certain purposes, due regard being had to its poisonous nature, and to the fact that it is decomposed by contact with lead, tin, or copper, and that lead pipes are soon rendered brittle and worthless by passing through them solutions of mercuric chloride. Its potency in dilute solutions (1:500 to 1:4000) makes it comparatively cheap,† and the danger of accidental poisoning from such dilute solutions is not very great. The concentrated solutions should be colored, as a precaution against accident, for they have neither color nor odor to reveal their deadly nature.

A standard solution which contains four ounces to the gallon of water, is of convenient strength for a concentrated solution, to be issued by manufacturers or health authorities, in properly labeled bottles. This may be colored with permanganate of potash,‡ or with indigo, or with aniline blue. Inasmuch as standard solution No. 2 of the committee on disinfectants is colored with the permanganate, it would perhaps be better to give this solution a blue color. The writer would suggest the following formula, in which another poisonous metallic salt contained in our list is combined with the mercuric chloride:

Bichloride of mercury.....	4 ounces.
Sulphate of copper.....	1 pound.
Water.....	1 gallon.

It must be remembered, in using this and other disinfecting solutions, that the condition relating to time of exposure to the action of the disinfecting agent is an important one. The experimental evidences§ relating to the germicide power of mercuric chloride, shows that the time of exposure being two hours, this salt may be safely recommended for the destruction of spore-containing infectious material in the proportion of 1:1,000, and of pathogenic organisms in the absence of spores in the proportion of 1:4,000, or even less, *provided that the micro-organisms to be destroyed are fairly exposed to its action*. The fact that mercuric chloride combines with and coagulates albuminous material, interferes to some extent with its

\* I. c., p. 659.

† It costs about fifty cents a pound by the quantity.

‡ Ten grains to the gallon is sufficient.

§ *The Medical News*, February 21, p. 205.

value as a disinfectant, and will be kept in view in the recommendations to be made hereafter relating to the practical use of this agent. Mercuric chloride is an efficient antiseptic in the proportion of 1:15,000, and it exercises a restraining influence upon the development of the spores of the anthrax bacillus, when present in culture solutions, in the proportion of 1:300,000, and even less.

7. *Dry Heat*.—Dry heat is only to be recommended for the disinfection of such articles as would be injured by exposure to moist heat, or to a disinfecting solution. A properly constructed disinfection chamber or "oven" is absolutely essential, if dry heat is to be used. The experimental evidence on record\* shows that the destruction of spores requires a temperature which would injure woolen fabrics (140° C. for three hours). In the absence of spores, however, articles which are freely exposed for two hours to a temperature of 110° C. (230° Fahr.) may with safety be considered disinfected. In practice it will be necessary to remember that the penetrating power of dry heat is very slight, and that packages, bundles, or even articles loosely thrown one upon another, cannot be disinfected in this way.

8. *Sulphur Dioxide* (sulphurous acid gas).—Fumigation with burning sulphur has long been a favorite method of disinfection. The experience of sanitarians is in favor of its use, in yellow fever, smallpox, scarlet fever, diphtheria, and other diseases in which there is reason to believe that the infectious material does not contain spores. The experimental evidence on record† shows that under certain conditions it is effective for the destruction of micro-organisms in the absence of spores, but that it is quite impotent for the destruction of these reproductive elements.

The presence of moisture adds greatly to the disinfecting power of this agent. It is freely soluble in water, one volume dissolving fifty volumes of the gas. It is therefore evident that a saturated aqueous solution is fifty times as strong as the pure gas—anhydrous. In aqueous solution, in the proportion of 1:2,000 by weight, sulphur dioxide kills micrococci in two hours' time.‡ In a gas-tight receptacle it destroys the infecting power of vaccine virus dried upon ivory points, when present in the proportion of one volume per cent, the time of exposure being six hours.§ The same proportion destroys anthrax bacilli, without spores, from the spleen of an animal recently dead, dried upon silk threads, in thirty minutes (Koch). These facts show that sulphur dioxide is a valuable disinfectant; but the conditions of successful disinfection, as established by the experimental evidence, are, that the material to be disinfected shall be freely exposed to its action for a considerable time, *in a receptacle which does not permit the gas to escape*. It must be remembered that disinfection of a thin layer of vaccine virus upon an ivory point, or of anthrax blood upon a silk thread, exposed in a gas-tight receptacle, cannot be taken as evidence that thicker layers of infectious material, attached to the surface of bedding and clothing, or inclosed in folded blankets, bundles of clothing, mattresses, etc., can be disinfected by the same amount of sulphur dioxide generated in a room which is not gas-tight. It has been shown, by carefully conducted experiments,¶ that the escape of sulphurous acid gas from a bed-chamber or hospital ward is very rapid, in spite of the usual precautions for stopping up crevices when such a room is to be fumigated; and infectious material, inclosed in bundles or protected by folds of blankets, etc., may escape dis-

\*See *Medical News*, March 14, p. 283.

†See Prelim. Rep., No. VII, *The Medical News*, March 28, p. 343.

‡l. c., p. 348.

§l. c., p. 344.

¶l. c., p. 347.

infection, after having been exposed for many hours in a tightly closed chamber containing ten volumes per cent of this gas.

9. *Carbolic Acid*.—The disinfecting power of carbolic acid has been fixed by experiments upon vaccine virus, and upon various pathogenic organisms. A saturated aqueous solution cannot, however, be relied upon for the destruction of spores; but in the absence of spores it is fatal to micro-organisms in the proportion of two per cent, the time of exposure being two hours. Indeed, less than one per cent is fatal to several of the species of pathogenic micrococci which have served as test organisms in the numerous experiments which have been made with this agent.\* Upon the recommendation of the famous Dr. Koch, the discoverer of the cholera bacillus, the committee on disinfectants, of the International Sanitary Conference of Rome (1885), has given this agent the first place for disinfecting soiled clothing, excreta, etc., in cholera. For excreta it is to be used in five per cent solution, and for clothing, etc., in two per cent solution. The experimental evidence upon record indicates that it may be relied upon in this proportion.

10. *Sulphate of Copper*.—This salt has been largely used as a disinfectant in France, and recent experiments show that in the proportion of one per cent it is a reliable agent for the destruction of the micro-organisms, in the absence of spores. It is much below mercuric chloride in germicide power, but is a better deodorant—not a better antiseptic—than the more poisonous salt. When we take into account its efficiency, it is comparatively cheap, and is to be recommended for certain purposes. It may be combined with the more potent germicide, mercuric chloride, in accordance with the formula already given.

11. *Chloride of Zinc*.—Solutions of chloride of zinc are largely used in this country and in Europe for disinfecting purposes. It is an excellent antiseptic and deodorant, but its power to destroy disease germs has been very much over-estimated. It may, however, be relied upon for the destruction of pathogenic organisms, in the absence of spores, in solutions which contain from five to ten per cent of the salt.

#### GENERAL DIRECTIONS FOR DISINFECTION.

“In the sick room we have disease germs at an advantage, for we know where to find them, as well as how to kill them. Having this knowledge, not to apply it would be criminal negligence, for our efforts to restrict the extension of infectious diseases must depend largely upon the proper use of disinfectants in the sick room.”†

*Disinfection of Excreta, etc.*—The dejections of patients suffering from an infectious disease should be disinfected before they are thrown into a water-closet or privy vault. This is especially important in cholera, typhoid fever, yellow fever, and other diseases in which there is evidence that the infectious agent is capable of self-multiplication, in suitable pabulum, external to the human body. Vomited matters, and the sputa of patients, with these and other infectious diseases, should also be promptly disinfected. This is especially important in cholera, diphtheria, scarlet fever, whooping-cough, and tuberculosis. It seems advisable, also, to treat the urine of patients sick with an infectious disease with a disinfecting solution.

For the disinfection of excreta, etc., in the sick-room, a solution of chloride of lime is to be recommended. This is an excellent and prompt

\* Prelim. Rep. of Com. on Disinfectants, No. VI, l. c., p. 317.

† Prelim. Rep. of Com. on Disinfectants of A. P. H. A.

deodorant, as well as a disinfectant. A quart of the standard solution (No. 1), recommended by the Committee on Disinfectants of the American Public Health Association, will suffice for an ordinary liquid discharge in cholera or typhoid fever; but for a copious discharge it will be prudent to use twice this quantity, and for solid fecal matter a stronger solution will be required. As chloride of lime is quite cheap, it will be best to keep on the safe side, and to make the solution for the disinfection of excreta by dissolving eight ounces of chlorine of lime in a gallon of water. The solution should be placed in the vessel before it receives the discharge. The material to be disinfected should be well mixed with the disinfecting solution by agitating the vessel, and from thirty minutes to an hour should be allowed for the action of the disinfectant, before the contents are thrown into a water-closet or privy vault.

*Standard Solution No. 2*, of the committee on disinfectants, which contains two drachms of corrosive sublimate and two drachms of permanganate of potash to the gallon of water, if used freely—one quart for each dejection—and left in contact with the material to be disinfected for at least four hours, is a reliable disinfectant *for liquid discharges*. The caution with reference to lead pipes must be remembered, and if this solution is used in the sick-room, or in hospital wards, it will be desirable to have receptacles of wood or earthenware for the disinfected material, which may be carried away and emptied in a suitable locality once in twenty-four hours.

The blue solution heretofore suggested would also be suitable for use in the same way, and with the same precautions. It contains four ounces of corrosive sublimate and a pound of sulphate of copper to the gallon of water. This concentrated solution should be diluted in the proportion of eight ounces to the gallon of water, and the diluted solution used as heretofore recommended—at least a quart for each dejection, and four hours' time. The disinfecting power of the copper salt adds to the value of this solution, and the bright blue color of the concentrated solution leaves nothing to be desired in the way of a color protection against accidental poisoning.

For the disinfection of the discharges of cholera patients, a five per cent solution of carbolic acid may be used in accordance with the recommendation of the International Sanitary Conference of Rome. The time necessary to insure disinfection is fixed at four hours.

Chloride of zinc in ten per cent solution may be used for the dejections of cholera patients, the same conditions being observed in regard to quantity and time of exposure as were fixed for the other metallic salts named.

It will be best to burn cloths used to wipe away the discharges of the sick, and especially those used in wiping away the infectious material from the mouth and nostrils of patients with diphtheria or scarlet fever. Bits of old muslin may be used for this purpose, and should at once be thrown upon an open fire or gas stove arranged in the fireplace for this purpose.

Infected sputum may be discharged directly into a cup half full of the solution of chloride of lime recommended for excreta, or of Labarraque's solution.

Handkerchiefs, napkins, and towels used in wiping away infectious discharges, if worth preserving, should be at once immersed in one of the following solutions: Chloride of lime, 2 per cent; carbolic acid, 2 per cent; mercuric chloride, 0.1 per cent ( $= 1 : 1,000$ ).

The blue solution (containing sulphate of copper), diluted in the proportion of four ounces to the gallon of water, may also be used for this purpose.

Cloths used for washing the general surface of the body should also be disinfected with one of the above mentioned solutions; and attendants should invariably disinfect their hands by washing them in one of these solutions, when they have been soiled by the discharges of the sick.

*Disinfection of the Person.*—Labarraque's solution, diluted with twenty parts of water, is a suitable disinfecting solution for bathing the entire surface of the body of the sick, of convalescents, or of those whose duties take them into the sick-room; or a 1 per cent solution of chloride of lime, or a 2 per cent solution of carbolic acid, may be used.

The International Sanitary Conference of Rome gives the following directions with reference to the disinfection of the body after death from cholera:

"The body should be enveloped in a sheet saturated with one of the strong disinfecting solutions,\* without previous washing, and should at once be placed in a coffin."

We see no objection to washing the body, if the strong solution of chloride of lime is used for this purpose. Washing with water would necessitate the careful disinfection of the water and cloths used for this purpose, and of the hands of the attendants. As the odor of chlorine or of carbolic acid would be objectionable under certain circumstances, we see no good reason for insisting upon the use of these agents, rather than on the odorless solution of mercuric chloride, which, in the proportion of 1 : 1,000, would no doubt be equally effective. But when there is an odor of decomposition to be neutralized, the solution of chloride of lime will have a decided advantage on account of its deodorizing properties.

*Disinfection of Clothing and Bedding.*—The cheapest and best way of disinfecting clothing and bedding, which is not injured by the ordinary operations of the laundry, is to immerse it in boiling water for half an hour or longer. It should be placed in boiling water as soon as removed from the person or the bed of the sick, and if it is necessary to remove the articles from the room in order to accomplish this, they should be wrapped in a sheet or towel thoroughly saturated with a disinfecting solution. If it is impracticable to disinfect such infected clothing and bedding *immediately* by boiling, it will be necessary to immerse it in one of the following disinfecting solutions, in which it should be left for four hours: Mercuric chloride, 1 : 2,000; or the "blue solution" of this salt and sulphate of copper, diluted by adding two fluid ounces of the concentrated solution to a gallon of water; or a 2 per cent solution of carbolic acid. The solution of chlorinated lime (2 per cent) may also be used, but we give the precedence to the first mentioned solutions, because of the bleaching properties of this solution. The blue solution does not injure clothing, and is to be preferred for domestic use to a simple solution of corrosive sublimate, which in the concentrated form is highly poisonous, and without odor or color. When diluted as directed, this solution may, however, be used without danger either from absorption through the hands, or by drinking. The metallic taste of the diluted solution could scarcely fail to prevent a fatal dose from being swallowed accidentally.

For outer clothing, and other articles which would be seriously injured by immersion in boiling water, the best disinfectant is *steam*. Exposure to steam at 100° C. (212° Fahr.) for half an hour would be equivalent to exposure in boiling water for the same time, if the clothing is hung up in such a manner as to be fairly brought under the action of the disinfecting agent. To be certain that the steam does not fall below this temperature in the disinfection chamber, a thermometer must be placed in a corner of

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\* Chloride of lime 4 per cent, or carbolic acid 5 per cent.



the room, at a distance from the point of entrance of the steam, or in an aperture from which the steam escapes. This should mark at least 100° C. for half an hour before the disinfection can be considered complete.\* To accomplish this, it is evident that the steam must come from the generator at a higher temperature, or, in other words, must be under pressure.

It must be remembered that the destruction of spores is the most difficult test of disinfecting power known, and one which excludes the use of carbolic acid, sulphur dioxide, and other agents which enjoy the confidence of sanitarians, and which have been proved by laboratory experiments to destroy pathogenic organisms in the absence of spores. There is good reason for the belief that *dry heat* and *sulphurous acid gas* may be safely substituted for steam for the disinfection of the clothing of patients with cholera, yellow fever, and smallpox, and probably in several other infectious diseases (puerperal fever, erysipelas, diphtheria (?), and scarlet fever (?)).

As disinfection by steam will injure certain articles, *dry heat* may be used as a substitute for moist heat, but in this case a temperature of at least 110° C. (230° Fahr.), maintained for two hours, will be required. In the use of dry heat, even greater care is necessary that the articles to be disinfected are freely exposed—that is, not placed in the oven in bundles, or piled one upon another, but freely suspended in the disinfecting chamber. For it has been shown by carefully conducted experiments that the penetrating power of dry heat is very slight. A properly constructed disinfection oven, such as that of Ransom,† will be required if dry heat is to be used.

As the appliances for disinfecting with steam or with dry heat are somewhat expensive, these agents are not likely to supplant, for general use, the time honored practice of fumigation with sulphurous acid gas. This method of disinfection commends itself because of the cheapness of the material used, and the facility of its application. Sulphur dioxide is a less reliable disinfectant than steam or dry heat, but when the necessary conditions are observed there is no doubt of its utility; and the fact that it does not kill the spores of anthrax, and of other bacilli, is no reason for rejecting an agent which has been demonstrated by experience to be one of great value, which has been proved by laboratory experiments to be fatal to pathogenic organisms in the absence of spores, and to destroy the infecting power of vaccine virus. But in using this agent the conditions of successful disinfection, which have been established by experiment, should be borne in mind. The room which is to serve as a disinfecting chamber must be very thoroughly closed; every crevice and keyhole should be carefully stopped with cotton, or by fastening paper over it. Even this precaution will not prevent the rapid escape of gas from cracks around doors, windows, etc. It is therefore desirable, when practicable, to use a disinfecting chamber which can be hermetically closed. The articles to be disinfected must be very freely exposed, and should never be thrown into the room in bundles, or piled one upon another. We concur in the recommendations of the committee on disinfectants of the American Public Health Association, as to the amount of sulphur which should be burned, and the method of effecting its complete combustion:

\* The committee on disinfectants of the International Sanitary Conference of Rome fixes one hour as the time during which steam should be made to pass over the articles to be disinfected.

† *British Medical Journal*, Sept. 6, 1873, p. 274.



To secure any result of value, it will be necessary to close the apartment to be disinfected as completely as possible, by stopping all apertures through which gas may escape, and to burn at least three pounds of sulphur for each thousand cubic feet of air-space in the room. To secure complete combustion of the sulphur, it should be placed, in powder or in small fragments, in a shallow iron pan, which should be set upon a couple of bricks in a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it.\*

Finally, we would remark, that in the absence of suitable appliances for disinfection, and in general when the infected articles are of little value, consumption by fire furnishes the readiest and safest method of disposing of such articles.

For articles of value, such as upholstered furniture, etc., which would be injured by any of the processes heretofore recommended, free exposure to the air (aeration) for three or four weeks is directed by the committee on disinfectants of the International Sanitary Conference of Rome. The same committee directs that "objects made of leather, such as trunks, boots, etc., should be destroyed, or washed several times with one of the weak disinfection solutions"—carbolic acid 2 per cent, or chloride of lime 1 per cent.

The means heretofore recommended for the disinfection of woollen clothing, blankets, and similar articles will not be sufficient for soiled mattresses. As a rule, they should be opened, and the contents disinfected by steam or by dry heat, with subsequent free aeration, and the cover should be washed in boiling water after treatment with a disinfecting solution.

*Disinfection of the Sick-Room.*—Every effort should be made to prevent a room occupied by patients sick with an infectious disease from becoming infected. Carpets, stuffed furniture, curtains, and other articles difficult to disinfect, should be removed at the outset. Indeed, nothing should be left in the room which is not absolutely required, and all furniture and utensils should be of such a character that they can be readily disinfected by washing with boiling water or with a disinfecting solution. Abundant ventilation and scrupulous cleanliness should be maintained, and a disinfecting solution should always be at hand for washing the floor, or articles in use, the moment they are soiled by infectious discharges. For this purpose a solution of chloride of lime may be used (4 per cent).

It is impracticable to destroy infectious material in an *occupied* apartment by means of gases or volatile disinfectants, for to be effective these must be used in a degree of concentration which would make the atmosphere of a room quite irrespirable. These agents are therefore useful only as deodorants. They are all more or less offensive to the sick, and will seldom be required, even as deodorants, when proper attention is paid to cleanliness and ventilation.

Daily wiping of all surfaces—floors, walls, and furniture—with a cloth wet with a disinfecting solution, is to be recommended. For this purpose a solution of chloride of lime (2 per cent), or of carbolic acid (2 per cent), or of mercuric chloride (1 : 2,000), may be used.

By such precautions as have been indicated, the infection of the sick-room may be prevented, especially in those diseases, such as cholera and typhoid fever, in which the infectious agent is not given off in the breath, or from the general surface of the body, of the sick person. In smallpox and in scarlet fever there is greater danger that the infectious agent may remain attached to surfaces in the room; for the atmosphere becomes infected with particles given off from the surface of the patient's body.

As already stated, the atmosphere cannot be disinfected while the room is occupied. There is much less reason for disinfecting it when the patient

\* Preliminary Report, l. c., p. 427.

has been removed, and it is much simpler to renew it by throwing open the doors and windows than to attempt to disinfect it. Indeed, there will be no infectious particles to destroy, except such as are dislodged from surfaces, window ledges, etc., where they have settled as dust while the room was occupied; and if the precautions above recommended have been taken, the danger of such reinfection of the atmosphere will be reduced to a minimum.

Disinfection of the vacated room, then, consists in the destruction of all infectious particles which remain attached to surfaces, or lodged in crevices, in interstices of textile fabrics, etc. The object in view may be accomplished by thorough washing with one of the disinfecting solutions heretofore recommended; but most sanitarians think it advisable, first, to fumigate the room with sulphur dioxide. This practice is to be recommended, and the directions given by the Committee on Disinfectants, already quoted, should be followed (3 lbs. of sulphur to 1,000 cubic feet of air space). At the end of from twelve to twenty-four hours, doors and windows should be opened, and the room freely ventilated. After this fumigation, all surfaces should be washed with a disinfecting solution (chloride of lime 2 per cent, carbolic acid 2 per cent, or mercuric chloride 1 : 1,000), and afterwards thoroughly scrubbed with soap and hot water. Plastered walls should be whitewashed. The fumigation recommended is especially important in the case of rooms, the walls of which are covered with paper, and in rooms from which curtains, carpets, etc., have not been removed; and under these circumstances it will, as a rule, be advisable to repeat the fumigation a second or even a third time. The process is inexpensive, and the old saying that "Whatever is worth doing at all is worth doing well," applies with especial force to the use of disinfectants. Excessive precaution can do no harm, but the inefficient use of disinfecting agents, which results from indifference, or from ignorance of the precise value of the agents relied upon, may be disastrous.

*Disinfection of Privy Vaults, Cesspools, etc.*—The contents of privy vaults and cesspools should never be allowed to accumulate unduly, or to become offensive. By frequent removal, and by the liberal use of antiseptics, such necessary receptacles of filth should be kept in a sanitary condition. The absorbent deodorants, such as dry earth, or pounded charcoal—or the chemical deodorants and antiseptics, such as chloride of zinc, sulphate of iron, etc.—will, under ordinary circumstances, prevent such places from becoming offensive. Disinfection will only be required when it is known, or suspected, that infectious material, such as the dejections of patients with cholera, yellow fever, or typhoid fever, has been thrown into the receptacles, which are especially dangerous, because they already contain pabulum suitable for the development of the germs of these diseases. Mercuric chloride commends itself especially for the disinfection of such masses of material, because, even if any germs escape immediate destruction, they will fail to multiply in the presence of this potent antiseptic. The chloride of lime solution, on the contrary, is preferable for use in the sick-room, because of the promptness and certainty of its germicide action and its deodorizing power. But it has the disadvantage, where large masses of material are to be disinfected, that it is itself destroyed by contact with organic matter; and that if there is a surplus of infectious material after the disinfecting solution has been neutralized, this will be as potent for mischief as a larger quantity would have been.

Mercuric chloride should be used *in solution*, in the proportion of "one pound for every five hundred pounds—estimated—of fecal matter con-

tained in the vault.\* All exposed portions of the vault, and the wood-work above it, should be thoroughly washed down with the disinfecting solution.†

The subsequent daily use of a smaller quantity of the same solution would insure the continued disinfection of fresh material thrown into the vault; or chloride of lime in powder may be freely scattered over the contents after the first disinfection with mercuric chloride. A diluted powder, made by mixing one pound of chloride of lime with nine pounds of plaster of Paris, or of clean, well dried sand, may be used for this purpose. This is more easily spread about, can be used more economically, and is sufficiently strong in chlorine for practical purposes. As chloride of lime is an excellent deodorant, as well as a disinfectant, such a powder commends itself for general use in open privy vaults and cesspools, not only during the prevalence of epidemics, but at all times when they give evidence of being in an unsanitary condition.

*Hospitals.*—The directions already given in regard to disinfection of the sick-room and its contents apply as well to hospital wards in which patients with infectious diseases are treated. In addition to this, it will be necessary in hospitals to guard against such infectious diseases as erysipelas, septicæmia, puerperal fever, and hospital gangrene. The antiseptic treatment of wounds, in connection with a proper regard for cleanliness and ventilation, has practically banished these diseases from well regulated hospitals. Of the first importance in effecting this are the precautions now taken with reference to the disinfection of sponges, instruments, the hands of attendants, etc.

Instruments of silver, such as probes and catheters, may be disinfected by passing them through the flame of an alcohol lamp. Instruments of steel, gum catheters, etc., may be disinfected by immersion in a five per cent solution of carbolic acid, or in a 1:1,000 solution of mercuric chloride. For instruments and vessels of copper, brass, and tin, boiling water, or the carbolic acid solution, may be used. Vessels of porcelain, or glass, may be disinfected by heat, or by either of the disinfecting solutions mentioned. Sponges should be kept permanently in one of the disinfecting solutions, or, what is better, may be dispensed with entirely for the cleansing of wounds. In place of them, irrigation with a disinfecting solution may be resorted to, or the discharges may be wiped away with some cheap absorbent material which can be burned after having been once used.

Patients in hospitals, with infectious diseases, will, of course, be kept in isolated wards. Everything which comes from such a ward should be disinfected, and the immediate attendants of the sick should not be allowed to visit other parts of the hospital without first changing their outer clothing for a recently disinfected suit, and washing their hands in a disinfecting solution. When relieved from duty their underclothing should also be disinfected; and they should take a complete bath with one of the weak disinfecting solutions heretofore recommended.

Every hospital should be provided with a steam disinfecting apparatus, or with an oven for disinfection by dry heat.

*Disinfection of Water and Articles of Food.*—The disinfection of drinking water on a large scale, in reservoirs, wells, etc., is impracticable. But it is

\* Recent experiments made by the writer make it apparent that the complete sterilization of large masses of fecal matter in privy vaults would be a difficult and expensive undertaking, if not entirely impracticable. It is, therefore, of prime importance that infectious material should be destroyed before it is thrown into a receptacle of this kind.

† Prelim. Rep. of Com. on Disinfectants, l. c.

a very simple matter to disinfect water which is suspected of being contaminated with the germs of cholera, typhoid fever, or any other disease transmissible in this way. This is readily accomplished by boiling. As already stated, all known disease germs are destroyed by the boiling temperature maintained for half an hour. The importance of this precaution during the prevalence of an epidemic of cholera or of typhoid fever cannot be overestimated, when the water used for drinking purposes comes from an impure source, or is liable to contamination by the discharges of patients suffering from these diseases. Those articles of food, and especially milk, animal broths, etc., which might serve as pabulum for disease germs, should, during the prevalence of an epidemic, be cooked but a short time before they are eaten. And such food, if put aside for some hours after it has been prepared, should always be again subjected to a boiling temperature shortly before it is served. Food which gives evidence of commencing putrefaction is unfit for use, and in time of epidemics is especially dangerous.

*Disinfection of Ships.*—It should be the aim of a physician attached to a passenger ship, or of the master of a vessel having no physician on board, to prevent the vessel from becoming infected when in an infected port, or when cases of infectious diseases occur on board. This is to be accomplished by keeping the ship clean; by disinfecting suspected articles, and especially the soiled clothing of passengers, before they are received on board; by the isolation of cases of infectious disease which occur on board; and by the thorough execution of those measures of disinfection recommended for the sick-room. When a case of cholera or of yellow fever occurs upon a ship at sea, it cannot be taken as evidence that the vessel is infected unless at least five days have elapsed since the person attacked came on board. For he may have contracted the disease from exposure at the port of departure, or in some other locality on shore. When, however, a longer time than this has elapsed, or when several cases developed in a particular locality on shipboard, either simultaneously or successively, the vessel must be considered infected, unless it is shown that the cases are directly due to the opening of baggage containing infected clothing.

In practice, the sanitary officials at the port of arrival usually treat a vessel as infected if any cases of infectious disease have occurred upon her during the voyage. This is a safe general rule, which should not be departed from unless a considerable time—five to seven days—has elapsed since the cases occurred, and they can be clearly traced to exposure before coming on board. In this case, if the ship is clean and the precautions relating to disinfection and isolation of the sick have been faithfully executed, the health officer may be justified in dispensing with the general measures of disinfection which are required for an infected ship.

These measures do not differ from those heretofore recommended for the disinfection of the sick-room and its contents; but the special conditions on shipboard, and the great interests at stake, make it essential that the execution of these measures should be in the hands of sanitary experts.

In the disinfection of ships, fumigation with sulphurous acid gas is a measure of prime importance, and is largely practiced by those in charge of quarantine establishments. The fact that the ship may be almost hermetically closed, and the escape of gas to a great extent prevented, makes this method of disinfection more trustworthy than in the case of dwellings and hospitals. The further fact, that certain parts of the ship are inaccessible for the application of disinfecting solutions, seems to make the use of a gaseous disinfectant imperative.

Disinfection by means of steam, especially of an iron vessel, would no doubt be a difficult matter on account of the condensation which would occur from contact with the cool walls of the vessel below the water-line. But it will be well to fill the vessel with steam before introducing the sulphur dioxide; for, as already stated, the disinfecting power of this agent is much greater in presence of moisture. A well equipped quarantine establishment should have an apparatus for generating sulphurous acid gas, and injecting it into vessels, as this is the most expeditious and satisfactory method of fumigating a ship.\*

An essential part of the disinfection of a ship will consist in the thorough cleansing of the bilge. The International Sanitary Conference of Rome prescribes that the bilge water shall be pumped out and replaced by sea water at least twice at each disinfection of the vessel. This is very well so far as it goes, but we would also recommend that after such cleansing, the potent disinfectant, mercuric chloride, be added to the clean sea water remaining in the bilge in the proportion of one pound to the ton of water—estimated. In the case of ships sailing from ports infected with yellow fever, it would be a wise precaution, after the cleansing of the bilge at the point of departure, to throw the same amount of mercuric chloride, dissolved in salt water, into the bilge, and to add a smaller quantity of the same solution at intervals during the voyage.

*Merchandise.*—Article V, of the Report of the Committee on Disinfectants of the International Sanitary Conference of Rome, says:

V. Disinfection of merchandise and of the mails is unnecessary. (Steam under pressure is the only reliable agent for the disinfection of rags—*les chiffons en gros*.)

We think this statement too broad, especially so far as merchandise is concerned which has been on board a ship infected with yellow fever. The poison of this disease seems to be capable of self multiplication on a foul ship in tropical latitudes, quite independently of passengers and crew. And there is ample evidence that even when no case has occurred on an infected ship at sea, those who are engaged in discharging her cargo after her arrival in port may be seized with yellow fever from breathing the infected atmosphere of the hold. Evidently, merchandise conveyed on such a ship should be disinfected. But it does not seem necessary to break packages which have gone on board in good condition, and a thorough fumigation with sulphurous acid gas will be sufficient if the unbroken packages are so distributed as to be fairly exposed to the action of the disinfecting agent. To accomplish this, and to effectually disinfect the ship, it will be necessary to discharge the cargo at the quarantine station.

The collections of the rag man cannot properly be placed in the same category with other merchandise, such as agricultural products, hardware, new cotton or woolen goods, etc. An exception with regard to rags is indicated, but not stated with sufficient precision, in the article which we have quoted. There is evidence that smallpox has been not unfrequently transmitted by rags, and sanitarians are generally agreed that it would be very imprudent to admit rags collected in or shipped from localities infected with cholera or yellow fever, without first subjecting them to thorough disinfection. The only practical way of accomplishing this seems to be by means of super-heated steam. To make this effective, it

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\*The New Orleans quarantine establishment is provided with an apparatus of this kind, which seems to be well adapted for the purpose. See paper by Dr. Joseph Holt, in the annual report of the A. P. H. A. for 1884.

will be necessary to open the bales, and spread out the rags in such a manner that they may be freely exposed to the action of the disinfecting agent, or to inject the steam under pressure into the interior of the bale through perforated metal tubes, as is practiced at the New York quarantine station.

#### PART SECOND.

#### *Individual Prophylaxis against Infectious Diseases.*

The State establishes quarantine stations, to guard against the introduction of infectious diseases of exotic origin; and in enlightened countries, sanitary officials, under the direction of the central Government, or of States and municipalities, are charged with the duty of guarding the public against such diseases. It is generally recognized that this is to be accomplished by the isolation of the sick, the use of disinfectants, and by general measures of sanitary police.

One way in which the individual may indirectly protect himself against such diseases is by using his influence to have this sanitary service placed in the hands of competent men, and in sustaining them in their efforts to exclude or stamp out infectious diseases by such measures as have been demonstrated by science and experience to be efficient for this purpose.

But this is not the kind of "individual prophylaxis" which we have to consider here. The question is: What can the individual do to protect himself and those immediately dependent upon him, under the various circumstances in which he may be placed, and especially in the presence of an epidemic?

As the advice we have to give will differ greatly according to the disease, we shall pass in review the principal infectious maladies of man, and shall attempt to give for each such practical instructions as will enable an intelligent person to take all practicable precautions for his own protection, and for that of his immediate family. We have first, however, to make some general remarks.

Infectious diseases are contracted by contact with the sick, through the medium of infected articles—"fomites"—or by exposure in infected localities.

The evident general rule of prophylaxis is, therefore, to avoid all of these sources of infection; but there are circumstances in which this is either impossible or unjustifiable. Duty calls the physician and the nurse into the sick-room, and no argument based upon self-protection can keep the devoted mother from the bedside of her sick child, or the wife from giving her personal attention to her husband, or the husband to his wife, when stricken by pestilence. Humanity requires that during an epidemic the sick shall be cared for, the dead buried, and the foul places cleansed. All this calls for the active and intelligent efforts of persons who have the courage to face danger, and not only of those who by their profession are necessarily brought in contact with the sick—physicians, clergymen, sanitary officials, nurses—but often, also, of volunteers; for, during the prevalence of an epidemic of cholera, or of yellow fever, the number of physicians and trained nurses within the infected area is commonly insufficient for the care of the sick.

The history of epidemics shows that brave men and women are to be found in every civilized country, who are willing to volunteer for such perilous duties; and also that physicians, and those whose legitimate duty it is to care for the sick, very rarely desert their post in time of danger; but the mortality among these brave men and women who stand by their guns,

and among the volunteers who go to their assistance, is often very great. There is a widespread notion among people not familiar with the facts, that doctors enjoy a certain immunity from infectious diseases not possessed by other people, and that the absence of fear is a safeguard against infection. Such a supposition is without foundation, and is an insult to the brave men and women who fall at their post of duty in every epidemic. Courage is no more a protection against disease germs than against bullets. It is true, that in epidemics, as in war, the skulkers and cowards often run into danger which the men in the ranks escape. The rashness which results from ignorance or from thoughtlessness is not courage, any more than the prudence which avoids danger when there is no good reason for facing it is cowardice. Those who rashly venture within the lines drawn by an epidemic, in the pursuit of business or pleasure, on the supposition that they will escape the prevailing disease because they are "not afraid," often fall victims to their unreasoning temerity, and not infrequently beat a hasty retreat, with blanched face, when they are brought directly into the presence of the sick and the dying.

Our advice to the brave is, do not put your trust in your courage, for it is no armor against infection. Rely rather upon those precautions which science and experience indicate as best suited to the special circumstances in which you may be placed, and do not hesitate to retreat before an invisible foe, when you are not required by considerations of duty to remain upon the field of battle. If your services are not required, you are simply in the way; and if you fall ill, you add to the labors of those who devote themselves to the care of the sick. And to the timid we would say, let not your fear control your actions, but look the circumstances fairly in the face, and be guided by reason and knowledge, or by the advice of those competent to decide for you. A premature flight may bring you into ridicule, or into greater dangers than those you flee from. Do not let your fears exaggerate the facts, and weigh these in the balance of your reason, and not of your apprehensions. The fact that Judge A or Colonel B has fallen a victim to cholera or yellow fever is no more a reason for deserting your home, than is the fact that the humblest citizen of your town has died from the same disease.

If courage is no protection against infection, it cannot be denied that fear, in the presence of the infectious agent, is a predisposing cause which frequently determines an attack, and which may turn the balance in favor of a fatal result. The depressing effect of fear is well known, and all influences which reduce the vital resisting power of the individual predisposed to an attack when an epidemic is prevailing.

Other predisposing causes of a general nature are those conditions of enfeebled resistance which result from ill health, venereal, and bacchanalian excesses, etc.

Of all these, it is probable that excessive indulgence in intoxicating drinks is the most potent factor in swelling the mortality returns during the prevalence of pestilential diseases. This predisposing cause acts in several different ways. The individual whose reason is befuddled by drink, stumbles stupidly into all kinds of danger. He is "not afraid" to sleep upon the ground, exposed to the night air, when yellow fever is prevailing, or to quench his thirst with water which a prudent man would reject as unfit to drink in the presence of cholera, or to wrap himself in a blanket which has recently been in use by a patient with smallpox. Again, the debility, often attended with digestive derangement, which follows a recent debauch, constitutes a most favorable condition for the reception of the germs of



cholera, of yellow fever, and of infectious diseases generally. Those who use intoxicating drinks habitually, but within the limits marked by that mental aberration or loss of reason which constitutes intoxication, are less subject to infection than the man who is suffering from the effects of a recent "spree." But if they have any organic disease of the stomach, the kidneys, or the liver, as a result of their habits, this constitutes a predisposition to be attacked, and is a very serious complication when an attack is developed.

Persons suffering from chronic wasting diseases, profuse discharges, or recent hemorrhage, are especially liable to become the victims of an infectious disease during its epidemic prevalence. The same is true of those whose vital resistance is below par from insufficient food, or from the continued respiration of vitiated air, crowd poisoning, sewer-gas poisoning, etc.

In addition to the predisposing causes mentioned, which furnish indications of more or less value with reference to individual prophylaxis, there are individual and race differences in susceptibility to certain diseases manifested by those who are in perfect health. One man may be repeatedly exposed to an infectious disease without falling sick, while another may suffer several attacks of a disease, such as smallpox, in which one attack commonly confers immunity. Race differences in susceptibility are shown in the relative immunity of the negro from the effects of the yellow fever poison, and the great susceptibility of the same race to smallpox.

We shall now consider in detail the question of individual prophylaxis against certain infectious diseases, which, by reason of their fatality and occasional widespread epidemic prevalence, seem entitled to special attention in an essay of this nature.

*Cholera.*—In Asiatic cholera the danger of infection from association with the sick, in the capacity of nurse or physician, is very slight. This is amply demonstrated by experience. On the other hand, laundresses, who do not come directly in contact with the sick, but who handle clothing soiled by their discharges, are liable to contract the disease. By far the greater number of cases, however, result from exposure in infected localities, and from drinking infected water. Outside of the area in India where cholera prevails as an endemic disease, localities become infected and the water supply contaminated as a result of the introduction of infectious material from previously infected localities, either in fomites, or through the medium of the discharges of the sick. These facts furnish the indications for individual as well as for general measures of prophylaxis.

In the sick-room the precautions to be taken are, to keep the room clean and well ventilated, to disinfect the discharges of the sick, and all soiled articles, as promptly as possible, and to wash the hands in a disinfecting solution when they have been in contact with the patient or with soiled clothing. Attendants should not take their food in the room occupied by the sick, and should not drink liquids which have been exposed in the sick room.

The general directions relating to diet, drinking water, etc., which we shall shortly give, apply to the attendants upon the sick, as well as to those at a distance from them; and it should be remembered, in the interest of the sick, that these attendants do not run any special risks beyond those to which all persons within the area of infection are exposed. Indeed, we may go further, and say that they run far less risk when they are in a well regulated hospital, and under intelligent supervision, than do those persons who dwell in the localities outside of the hospital from which the cases under their charge have come.



Attendants upon the sick should have their meals at regular hours, should not be deprived of a fair allowance of sleep, and should never be allowed to become exhausted by protracted vigils or excessive fatigue.

When cholera has been introduced into a country, and is extending its limits from day to day, one of the first questions which will present itself to those who are able to change their place of residence will be, whether they shall attempt to keep out of its way, and if so, where it is best to go. The answer to this question must depend very much upon circumstances. Those who are unfortunate enough to live in a city or town which has a bad sanitary record, which is not provided with an efficient health department, or does not provide money to enable the officers appointed to do efficient work, had better decamp in good time, so as to evade the foe entirely, or to meet it upon a field more favorable for defensive operations. There should be no stampede, and no running away in haste, without any definite idea of why and where. The time to go is before the disease has fairly obtained a lodgment. Consider that if the season is not far advanced, and the town is in an unfavorable sanitary condition, there is every reason to anticipate that the first cases will be followed by a severe epidemic, and decide at the outset whether you will put your castle in order to stand a siege, trusting to well considered measures of individual prophylaxis, or whether you will beat a masterly retreat in advance of the first assaults of the enemy. Those who vacillate in the hope one day that the epidemic is on the decline, and in the fear the next that it will sweep everything before it, in the end very often stay, when they could just as well have gone, and at the same time neglect those precautions which they should have taken at the outset if they had decided to stay.

To those who are unable or unwilling to desert their homes, we would say, that when proper precautions are taken the danger is really not very great, and that sanitarians look for the day when cholera will be practically banished from civilized countries. See that your premises are in good sanitary condition, and do what you can to induce your neighbors and the authorities in your town to prepare for the storm. Look especially after the plumbing of your houses, and if there is a cesspool or a privy vault upon your premises, see that it is kept in good condition by the use of antiseptics and deodorants.\* Above all, be sure that no food comes into your house except such as is sound and good, and that the drinking water used by your family is beyond suspicion. Well water is always open to suspicion, and in general, during the prevalence of cholera, it will be advisable to *boil all water used for drinking purposes*. This is a prophylactic measure of prime importance, and there is good reason to believe that if faithfully executed it would, to a great extent, limit the ravages of the Asiatic pestilence. Tea and coffee recently made can be taken with impunity. Milk, during the prevalence of an epidemic, should be boiled before it is used as food. Mineral waters, if bottled at places distant from the infected area, may be drunk in moderation. A moderate amount of sound wine, which was bottled prior to the epidemic, may be permitted to those who are in the habit of using it. Those not in the habit of using stimulants should not resort to their use during the progress of an epidemic. Those accustomed to them should restrict their libations within moderate limits, and will find a little brandy and soda, or Apollinaris water, to be better than wines, and especially than the acid wines, which are apt to derange the digestion.

Food should be plain and well cooked, and should be taken in moderate

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\* See Part First of this essay for details relating to the use of these agents.

quantities. Intemperance in eating is quite as bad as intemperance in drinking. Soups, meats, and vegetables should always be served hot, and should not be put aside for a future repast, or, if served a second time, should be brought to the temperature of boiling water shortly before they are eaten. Pastry and rich puddings, and all coarse and indigestible meats and vegetables, are to be avoided. Sound, ripe fruit, which has been brought to the house with the outer skin unbroken, may be eaten in moderation by those who know by experience that it agrees with them. It should be carefully washed before it is eaten. Melons, cucumbers, unripe apples, peaches, or pears, acid fruits generally, and, in short, all those articles which are known to give rise to digestive derangements in the absence of cholera, would better be banished from the supply list during the prevalence of this disease.

Next to the precautions relating to food and drink, we would place those relating to personal habits and clothing. The bowels should not be allowed to become constipated, and, on the other hand, any tendency to diarrhœa should at once receive attention. This is a matter of the greatest importance, and, indeed, is second to none other in individual prophylaxis. Absolute rest, a light diet, and a dose or two of chlorodyne, or of Hope's mixture, or of any approved combination of an opiate and an astringent, will usually suffice to control a slight diarrhœa, even if it is of a choleraic character.

The clothing should be suited to the season, but great care must be taken that it is warm enough at all times to prevent the body from becoming chilled. A broad flannel belt worn about the abdomen is recommended by some physicians of experience, and may be useful. Baths should be taken at frequent intervals, but should not be too prolonged or too cold, and should be followed by a vigorous rubbing of the surface, to establish reaction. Excessive exercise and fatiguing labor of all kinds are to be avoided. One should never feel "done up," as a result of his exertions in the way of business or of pleasure, for the lassitude resulting from over-exertion, like that which results from fear, predisposes to an attack. Mental depression is, so far as possible, to be avoided; grief, despondency, and "carking care," are recognized as predisposing causes in cholera and in other infectious diseases.

The use of "sulphuric acid lemonade"—that is, of pure water acidulated with this acid and sweetened to taste—has been recommended as a prophylactic, and there is some evidence in favor of its usefulness. We would not advise its indiscriminate use, or that of any other prophylactic of this nature. When cholera has made its appearance in a dwelling or in a public institution, the inmates may be given this, to the exclusion of all other drinks.

*Yellow Fever.*—This disease, like cholera, is contracted in infected localities, rather than by contact with the sick. Indeed, it is rarely, if ever, communicated directly by a sick person to his attendants. In infected places the poison seems to be given off from the soil, or from collections of decomposing organic matter, and we have no definite evidence that it is communicated through the medium of food or drinking water. The history of epidemics of this disease shows that when it obtains a lodgment in a city or town which is in an insanitary condition, in southern latitudes and during the Summer months, it extends its area and invades new localities similarly situated, until frost occurs, or at least until the weather becomes comparatively cool in the Autumn. Those who remain in an infected area, unless protected by a previous attack, are almost certain to

contract the disease, and much less can be done in the way of individual prophylaxis than in cholera. We therefore advise all those who can get out of the way of this fatal disease to do so. As a rule, there will be plenty of time, after there is evidence that the disease has established itself in certain parts of a city, for those who live at a little distance from these centers of infection to get away, in a deliberate and well considered manner. The occurrence of one or more imported cases cannot be taken as evidence that an epidemic will follow, and is no reason for deserting one's home. If proper precautions are taken by the sanitary authorities, it is very probable that no evil result will follow such importation of the disease. But when these imported cases are followed by the occurrence of other cases in the vicinity where they have been sick, or when such local cases occur in the vicinity of the wharves where vessels from infected ports discharge their cargoes, or in sailors' boarding houses, etc., it must be taken as evidence that the disease has effected a lodgment, and that infected centers have been established, from which an epidemic will in all probability be developed, if the season is favorable and the city in an insanitary condition.

An epidemic is not developed so rapidly as in the case of cholera, but the disease usually extends its limits in a very deliberate way, and while it is claiming its victims in one section of a city, other sections in the immediate vicinity may be quite healthy. But the territory invaded remains infected until cold weather puts an end to the epidemic. Frequently it happens that no new cases occur in an infected area for several weeks, or even months, for the simple reason that all those who remained to do battle with the pestilence have suffered an attack or are protected by a previous attack. The epidemic has ceased for want of material, but the infection remains, and will manifest itself if unprotected persons venture within the infected area from a mistaken idea that there is no more danger because there are no longer any cases.

In this disease, then, the most important point in individual prophylaxis is to keep away from infected localities, and from those places where the disease is epidemic—*e. g.*, Havana, Vera Cruz, Rio Janeiro—during the season of its prevalence. Very many lives have been sacrificed by a misplaced confidence in the protection which courage is supposed to afford against this disease. "I am not afraid," says the merchant whose business calls him to an infected city, or the sea captain who wishes to obtain a cargo of sugar in Havana during the Summer months. But not being afraid does not prevent such persons from being attacked, and the mortality at Havana among sailors from northern latitudes is very great. There is a tendency in places where the disease is endemic to underrate its malignity, and to ascribe every fatal case to some fault on the part of the unfortunate victim or his attendants. He was "frightened to death," or "was not properly nursed," or he was "imprudent," etc. The mortality is, no doubt, largely influenced by these secondary causes, but yellow fever is a malignant disease, which, under the most favorable circumstances, is very fatal to unacclimated strangers within the limits of its endemic prevalence, and which, in its epidemic extension in new territory, claims from thirty to fifty per cent, or even more, of those who fall sick, as its victims. This being the case, we repeat our advice to all those whose duty does not require them to stay on the field of battle, to make an orderly retreat to some place of safety.

The precautions relating to food and to personal habits do not differ materially from those recommended in the case of cholera. The diet

should be simple, and excesses should be avoided. Less care will be necessary with reference to the use of fruits and vegetables—indeed, they are rather to be recommended as better suited than animal food to the warm latitudes in which this disease prevails. Constipation should, above all things, be avoided; and if there is evidence that the functions of the liver or kidneys are imperfectly performed, suitable medication should be resorted to.

There is no special danger from the use of water, if it is from a source which insures it from contamination with organic impurities. Spirituous liquors, if used at all, should be taken in great moderation. Nothing is more likely to develop an attack than alcoholic excesses, and the habitual drunkard is almost doomed to death if he falls sick with this disease. Exposure to the direct rays of the sun, excessive fatigue, and venereal excesses are all predisposing causes which it is within the province of individual prophylaxis to avoid. Exposure to the night air, and especially sleeping out of doors near the ground, is recognized by experienced physicians in yellow fever regions as an invitation to an attack. Great care should be taken to avoid chilling of the body, and it is well to sleep as far from the ground as possible. The creoles of Louisiana and of the West Indies generally insist upon closing the windows of a sleeping room at night.

The mortality among natives of tropical climates, and especially among those whose habits are good, and who are accustomed to a frugal mode of life, is very much less than among the natives of northern latitudes, when these come, without any previous "acclimation," within the influence of the yellow fever poison. Those who are habituated to life in the extreme South enjoy a certain immunity from the effects of the poison, which is shown by a lower death rate rather than by any exemption from being attacked. One attack of this disease, as a rule, confers immunity from a subsequent attack.

Individual prophylaxis in an infected city will include the avoidance of those localities which give special evidence of being infected, and especial care not to visit such localities at night.

The liberal use of disinfectants in cesspools and water-closets, and a perfect state of sanitary police in and around the premises, will constitute a most important part of the precautionary measures which every individual should take for his own protection and that of his family. A state of mental equilibrium, and an intelligent appreciation of the special circumstances in which he is placed, and of the various measures of prophylaxis heretofore indicated, will enable an individual to look the facts fairly in the face, and to be governed by the light of reason and of science. Unfortunately it too often happens, among the ignorant and degraded, that a spirit of bravado, attended with a neglect of the simplest sanitary precautions, and a disposition to deny the presence of the dreaded foe, prevails during the earlier stages of an epidemic, and that this is followed by a disorderly stampede and a disgraceful neglect of the sick, when the presence and malignant nature of the pestilence are recognized.

*Smallpox.*—This disease is contracted by exposure to emanations from the body of the sick, or from articles which have been in use by them, or exposed in their vicinity. There is no evidence that the smallpox poison multiplies external to the human body, and the indications for prophylaxis are therefore quite different from those already given for cholera and yellow fever. One may eat what he pleases, and wallow in filth, when smallpox is prevailing, without contracting the disease, so long as he keeps away

from the sick, and is not brought in contact with any article infected by them. In this disease, however, as in the infectious diseases generally, previous personal habits will greatly influence the result when exposure does occur; and the disease is more fatal to the victims of alcoholism, to those who are poorly nourished, and in general, to those whose vitality is reduced by exposure to noxious effluvia from putrefying material, by living in overcrowded and ill ventilated apartments, etc.

As it is now the universal practice to isolate smallpox patients as soon as the disease is recognized, the danger of coming, accidentally, in contact with them is not great. There is but little danger of infection from passing within a few yards of a patient with smallpox in the open air, or from passing a building in which cases are under treatment. Unprotected persons who enter the sick-room are, however, extremely liable to contract the disease; and the infectious material given off from the patient's body clings most tenaciously to surfaces, to clothing, etc., and may give rise to an attack after many months, unless destroyed by disinfection.

It is evident, then, that individual prophylaxis will include the avoidance of places which have been occupied by the sick, and of articles used by them, unless there is a certainty that they have been thoroughly disinfected. It is probable that an unprotected person, who feels obliged, for special reasons, to enter the sick-room, may escape infection by the use of an air filter placed over the mouth and nostrils. This should be constructed on the principle of the "Tyndal respirator," in which all inspired air is made to pass through a layer of cotton wadding, which arrests suspended particles. It would be necessary immediately on coming out of the room to burn the cotton filter, to bathe the hands and face in a disinfecting solution, and to change the outer clothing.

It is a general rule in regard to infectious diseases that those who are necessarily exposed to them should take the precaution of not going into the sick-room with an "empty stomach," or in a condition of exhaustion from any cause. A cup of coffee, or a glass of wine and a cracker, may be taken if a considerable interval has elapsed since the last regular meal.

It is well known that against smallpox we have a special measure of prophylaxis, which has restricted the ravages of this disease within the limits which are left to it by carelessness in regard to the application of this measure, or ignorance of its value. Since the famous discovery by Jenner, vaccination has become the prophylactic *par excellence*.

The immunity conferred by vaccination is, as a rule, complete; but there are exceptions to this rule, and vaccinated persons occasionally suffer from a modified form of the disease. The statistics of the London smallpox hospital show that the mortality among unvaccinated persons received into that hospital with smallpox, is 35.55 per cent; while the mortality among vaccinated persons is less than 7 per cent. No doubt a large portion of the cases of post-vaccinal smallpox might have been prevented by revaccination.

It is now recognized that the protective influence of vaccination is not always of a permanent character, and children who have been successfully vaccinated in infancy should be revaccinated when they reach the age of puberty, or sooner, if smallpox is prevailing in the neighborhood. The operation is so trifling that it is customary to vaccinate old and young, with the exception of those who have been successfully vaccinated within a year or two, whenever an outbreak of smallpox occurs. This practice is to be recommended, but when the operation has been performed in a proper manner, with virus which is known to be reliable, it is folly to insist upon

a frequent repetition of the vaccination, because "it didn't take." If the first vaccination has been completely successful, a *perfect* result from revaccination is not usually obtained; and the fact that no result is obtained must be taken as evidence that the person is protected. The prophylactic value of vaccination practiced after exposure to smallpox has been demonstrated, and one who is not entirely certain that he is protected by a recent successful vaccination will do well to resort to this important prophylactic measure at once, if he has reason to suspect that he has been exposed to smallpox.

*Scarlet Fever.*—In this disease, as in smallpox, the poison is given off from the bodies of the sick, and is not reproduced independently of them. As we have no knowledge of any means of protection corresponding with vaccination, prophylaxis consists solely in keeping out of the reach of infection by the sick, or by articles infected by them.

The sick person may communicate the disease during the whole period of his illness and convalescence—a period which often extends to five or six weeks, or even longer than this. Infected clothing, which has been packed away for months, may communicate the disease; and there are numerous instances on record of its transmission to children at a distance from the sick, by healthy persons who have recently come in contact with scarlet fever patients. The lower animals, and especially pet cats and dogs which may have visited the sick-room unnoticed, or which are thoughtlessly given to convalescent children for their amusement, constitute a great source of danger. Persons who have suffered an attack of the disease, or who have but little susceptibility to it, may have a slight sore throat as a result of exposure to the scarlet fever poison, and may communicate the disease in its more severe form to unprotected children. One great difficulty in arresting the progress of an epidemic by isolation of the sick and disinfection, results from the fact that these slight and often unrecognized cases are frequently allowed full liberty.

Infection has been traced to milk which had been standing in the sick-room, or to the same liquid which had become infected at a dairy where scarlet fever had prevailed, and where recent convalescents were permitted to milk the cows.

All of these facts point to a most rigid exclusion of susceptible children from every possible source of infection. The susceptibility of adults is very much less, and, when attacked, they usually have the disease in a mild form. But their responsibility extends far beyond the point of avoiding the sick for their own protection. Those who are associated with susceptible children have no right under any circumstances to visit the room of a scarlet fever patient without taking the most thorough precautions with regard to the disinfection of their person and clothing immediately upon leaving it; and even with these precautions, such a visit cannot be justified when it is made simply out of curiosity or friendship. Only those who are in attendance upon the sick should be allowed in the sick-room, and they must be regarded as infected persons, who are not to be permitted to come in contact with unprotected children while they are engaged in this duty.

*Diphtheria.*—This is a disease in which the infectious material is given off from the surfaces affected, and probably not from the general surface of the body. As the usual seat of the disease is the throat and the nasal mucous membrane, it is the discharges from these surfaces which are especially dangerous. Although adults are much less susceptible to the disease than children, there have been numerous instances in which they have contracted diphtheria by the accidental reception of a bit of infectious

material directly into the fauces. This is especially liable to occur during the operation of tracheotomy; and several physicians have lost their lives in this way, in their efforts to save those of their patients by aspirating through the tracheotomy tube. It seems extremely probable that the diphtheritic poison—germ—is capable of increase, independently of the sick, in damp, foul places, such as sewers, damp cellars, and especially under old houses in which the floors come near the surface of the ground, leaving a damp, ill-ventilated space. At all events, the disease often clings to such houses in spite of the application of the usual means of disinfection. There is no doubt as to the influence of bad hygienic conditions in maintaining the infection when the disease has been introduced, and it is possible that such conditions may, in certain cases, originate it.

Insufficient nourishment, the malarial poison, and insanitary surroundings are predisposing causes to the disease. Those suffering from scarlet fever, measles, whooping-cough, and tuberculosis are also especially liable to be attacked. As in the case of scarlet fever, mild cases, which in the absence of others more pronounced it would be difficult to recognize as due to the diphtheritic poison, may give rise to malignant diphtheria in more susceptible individuals, or in those whose vital resisting power is reduced by any of the causes mentioned.

Prophylaxis will demand complete non-intercourse with the sick, avoidance of infected localities, and care to exclude all persons and articles coming from such houses from contact with yourself or children. The disease is often spread by thoughtless persons who visit the sick-room, and even kiss the infected patients, and then, without any precautions in the way of disinfection, fondle healthy children in other places, and perhaps transmit by a kiss the infectious material which has adhered to their lips. The possibility of transmission by pet animals is also to be borne in mind.

*Tuberculosis.*—Recent researches have demonstrated that tubercular consumption is an infectious disease, and that the sputa of those affected with it, injected into susceptible animals, reproduces in them the same disease. This sputum is therefore infectious material, and should be destroyed by burning, or by the use of chemical disinfectants. There would be little danger of infection from the moist masses of sputum, but in a desiccated condition this material is liable to reach the lungs of susceptible individuals, and to induce the disease.

It is well known that there is a great difference in susceptibility to pulmonary consumption, and that in certain families this disease carries off one member after another, while it is unknown in other families. Those who have this hereditary predisposition should pay special attention to individual prophylaxis. They should avoid intimate association with consumptive persons, should live under the best hygienic conditions, in dry, well ventilated apartments, and should select an occupation which will keep them in the open air, rather than one which keeps them confined to the house. Above all, they should avoid the respiration of an atmosphere loaded with organic impurities, or with irritating inorganic particles—dust of various kinds. Out of door life on the high and dry plains in the center of the continent, or in the mountains, will in most instances enable them to overcome the predisposition, if commenced before infection and the resulting tubercular lesions have occurred.

Those who are engaged in occupations which require them to pass some hours each day in an atmosphere loaded with dust will do well to wear a respirator for filtering the suspended particles from the air; for it is demon-



strated that, independently of hereditary predisposition, the respiration of such an atmosphere predisposes to tubercular disease of the lungs.

*Typhoid Fever.*—In this disease, as in cholera, the infectious agent is contained in the alvine discharges of the sick. In the interest of self-preservation as well as in that of the public good, every individual who has charge of cases should see that the evacuations from the bowels are thoroughly disinfected before they are thrown out.

The drinking of water contaminated with such infectious discharges is recognized as a very frequent mode of infection; and individual prophylaxis demands an intelligent consideration of the source from which a supply of drinking water is obtained for personal or family use. If there is the least reason to suspect that this supply may be contaminated by typhoid material, or if it contains an undue amount of organic impurities, it should be rejected entirely, or boiled shortly before it is used.

Typhoid epidemics have in several instances been traced to using milk which had been contaminated by infected water, added to it directly, or used at the dairy to wash the vessels containing it. The remedy in this case is to verify the purity of the source of supply of all milk used for drinking, or to boil it immediately before it is used.

The water of wells located within the limits of a city or village should not, as a rule, be used for drinking purposes, for the soil is almost certain to be polluted; and it often occurs that the contents of privy vaults and cesspools pass into the same porous stratum of sand or gravel from which the well water is obtained, or that surface drainage finds its way into shallow wells. It will be necessary, also, to regard with suspicion the water of small streams and ponds which are so situated that they may receive the drainage from collections of filth upon their margin.

Next to impure water we must place impure air as a factor in the etiology of typhoid fever. There is good reason to believe that the germs of the disease may be carried by the foul gases which are given off from sewers, privies, etc., when these become infected, and that the disease may be induced by the respiration of such a contaminated atmosphere. At all events, the breathing of a vitiated atmosphere, and insanitary surroundings generally, constitute predisposing causes which should be avoided.

In typhoid fever, as in yellow fever and cholera, depressing mental emotions, such as grief, despondency, or fear, and physical exhaustion from excessive fatigue, insufficient food, etc., are predisposing causes which may induce an attack in the presence of the infectious agent.

*Concluding Remarks.*—This chapter might be greatly extended, but, having passed in review the principal measures of individual prophylaxis against those infectious diseases which are most fatal, we shall not dwell upon precautions to be taken in other contagious diseases, such as measles and whooping-cough. These precautions will not differ from those already recommended in the cases of smallpox and scarlet fever. So, too, in regard to the infectious skin diseases. These are communicated by personal contact, and rarely occur except among those who neglect personal cleanliness, as well as other sanitary laws. Soap and water will generally suffice for individual prophylaxis. By avoiding filthy persons as well as filthy places, the danger of contracting these and certain other unmentionable infectious diseases will be reduced to a minimum.



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TO THE

Ninth Biennial Report of the State Board of Health of California.

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